AMERICAN

DYESTUFF REPORTER

VOLUME 34 DECEMBER 17, 1945 NUMBER 26

Annual Meeting of the

TEXTILE RESEARCH INSTITUTE

THE various research projects of the Textile Research Institute, Inc., and the Textile Foundation, now in progress in their laboratories at Princeton, N. J., were reported at the technical sessions of the Institute at its Annual Meeting in New York on November 9.

At the luncheon, Prof. H. D. Smyth discussed the subject of atomic energy. Professor Smyth, Chairman of the Department of Physics at Princeton University, is the author of the official report on the development of the atomic bomb. The published report, titled *Atomic Energy*, is now on sale in book stores. Professor Smyth described some of the highlights of this spectacular development, and some of the possible peacetime applications which may result from the work already accomplished.

The first session of the day was a meeting for members of the Institute at which reports of committees were made and officers and directors were elected.

TECHNICAL SESSION

Following this meeting was a technical session under the chairmanship of Dr. Henry Eyring, Professor of Physical Chemistry at Princeton University, and Director of Research for the Textile Foundation.

Following are abstracts of the papers presented:

THE BEHAVIOR OF BLEACHED FABRICS TOWARD ACID AND ALKALI

By DR. EUGENE PACSU

Chemistry Dept., Princeton University and the Textile Foundation Staff

The behavior of the aldehyde type of oxycellulose prepared by the action of 1 mole of sodium metaperiodate on cotton was investigated. Treatment of the oxycellulose with 2N hydrochloric acid at room temperature caused no apparent changes in the properties of the material. The comparatively great resistance to acid of the C-C-C linkages in oxycellulose deserves special consideration in view of the widespread belief concerning the harmful effect of acids on oxidized cellulose. The enhanced reactivity of the aldehyde type of oxycellulose in alkaline media presents difficult problems. Numerous reversible and irreversible changes may take place in the presence of hydroxyl-ions. Because of these changes, an aqueous solution of periodate oxycellulose, although practically neutral to litmus, uses up a considerable quantity of standard alkali solution, without, however, having a sharp end-point in the presence of phenolphthalein. Therefore, methods of determination of the *supposed* carboxyl content of the aldehyde type of oxycellulose by direct or indirect use of alkali are fundamentally unsound. The cause of the acidic behavior of periodate oxycellulose in alkaline solution is sought in the anionotropic and prototropic changes which may conceivably take place. An anionotropic change involving the transfer of a hybride ion from one aldehyde group to the other within one dialdehyde unit of the chain (Cannizzaro reaction) should give an essentially undegraded product having a probably random distribution of glyoxylic acid and glycolaldehyde acetal units. Experimental evidence, however, indicated that periodate oxycellulose, in the presence of 1 mole of dilute alkali and *without* subsequent acid hydrolysis, suffered an almost complete degradation. This behavior leads directly to a consideration of the prototropic changes as the second type of transformation which may take place in alkaline media. Because of the presence of CH—C=O groupings in the aldehyde type of oxycellulose, the substance must be in equilibrium with the tautomeric enol-form which, on account of the glyoxal part of its units, represents a "hydroxy-ketene acetal" of acidic character. Now it is known that negatively substituted ketene acetals hydrolyze rapidly to the corresponding esters in pure water or even in alkaline media by the loss of 1 mole of alcohol. It is, therefore, concluded by the author that the enolate ion of the aldehyde type of oxycellulose is instantaneously cleaved by an electrophilic attack of the water molecule which, by a displacement mechanism, breaks one of the C-O-C linkages to yield the enol-form of glyolic acid ester. The latter is subsequently hydrolyzed through the well-known mechanism for base-catalyzed hydrolysis to give rise to the sodium salt of glycolic acid and erythrose, which is then decomposed in the alkaline medium. All these reactions leading to the complete degradation of the oxycellulose may take place simultaneously as competing reactions. On the basis of this working hypothesis the ageing of alkali cellulose can also be interpreted. The author believes that most of the oxidizing agents, oxygen in alkaline medium being one of them, attack the glucose anhydride units of the cellulose in the same fashion as periodic acid does. The dialdehyde units so formed are at once cleaved in alkali through the mechanism outlined above. The result is a cellulose with shorter chains and more end groups, hence with high copper number and low viscosity. Evidently, complete elimination of the aldehyde type of oxidation by the use of suitable bleaching or oxidizing agents should result in improved fibers which would not deteriorate rapidly in even a mildly alkaline medium such as a soap solution. On the other hand, if the employment of bleaching or oxidizing agents which produce the aldehyde type of oxycellulose is unavoidable, then the use of some neutral or slightly acidic detergent instead of soap would be most advantageous.

METHOD OF CORRELATION OF EQUILIBRIUM MOISTURE REGAIN IN TEXTILE FIBERS: THEORETICAL AND INDUSTRIAL IMPLICATIONS

By JOHN C. WHITWELL

Chemical Engineering Dept., Princeton

University and Textile Research Institute Staff

Data from the literature on the effect of relative humidity and temperature on moisture regain in textile fibers have been restudied. By the use of a graphical analysis not previously applied to such data, an excellent correlation has been obtained. Extrapolations to regions not covered by the data appear to be entirely satisfactory.

On the plot used, lines of constant moisture regain for each fiber may be extended to a common point of intersection. The mathematical existence of such "common points" has been proved to be probable. Since the position of the common point varies for each fiber studied, its location has been a matter of theoretical interest. The coordinates can be located at least qualitatively from a knowledge of the chemical structure and the swelling behavior.

From the theoretical implications noted above, it is possible with a considerably reduced amount of experimental data to make predictions of the moisture relations in fibers not previously tested. These relations are of value in determining moisture regain in any of its textile implications; it is immediately applicable to establishment of proper conditions in convection driers. Moreover, from knowledge gained of the various reactions of fibers to their previous history, implications regarding instruments for quick moisture determinations are deduced. Certain general warnings are indicated.

HOW MOLECULAR STRUCTURE DETERMINES THE STRENGTH OF TEXTILE FIBERS

By DR. HENRY EYRING
Chemistry Dept., Princeton University and the Textile Foundation

Quantitative representations of the mechanical behavior of various types of rayon, cotton, silk and woolen fibers have been found. The model used is a spring in parallel with a system consisting of a dashpot and spring in series. The dashpot of this model does not follow the ordinary law for a Newtonian viscous fluid postulated by Maxwell but rather the non-Newtonian hyperbolic sine law of chemical reactions. The result of this is that a fiber tends to show creep only when considerable force has been applied and then returns only very slowly to its original length when the force ceases. The mathematical equations for the behavior in terms of molecular properties are developed and applied. The molecular parameters found fill out the picture which X-ray diffraction, molecular weight and other methods have been giving us of the nature and arrangement of the molecules. Such information suggests the changes in composition and structure required to adapt the fiber to its various uses.

The analysis has been carried out of complicated stress strain curves at constant rate of loading, constant rate of lengthening or in fact for any testing methods for which there is a linear relationship between load, length of fiber and time. The procedure outlined in the talk can be read in detail in a series of papers published and yet to appear in the *Journal of Textile Research* by Halsey, White, Stein and Eyring. Briefly stated it consists in treating the stress on the fiber as the sum of a stress on the spring and on the spring-dashpot. The stress on the spring in many cases approximates Hookean behavior, i.e., the strain is proportional to the stress. The stress on the dashpot-spring unit first increases linearly with the strain. As the strain increases the stress ceases to rise and approaches a limiting value when all further strain consists in slipping of the dashpot with no further lengthening of the spring. Addition of these two types of stress strain curves then suffices to quantitatively account for extremely complicated hysteresis loops of actual fibers.

Water acts as a plasticizer by lubricating the dashpots. This is done by lowering the activation energy for flow. Such an effect is frequently observed in the wetting out of fibers which removes what would otherwise be an almost permanent set. The pressing of clothes, the permanent waving of hair, and thermosetting of hosiery illustrate the efficacy of heat as well as plasticizers and large stresses in inducing a state of strain which disappears but slowly under less drastic conditions. All of these effects have their natural explanation in the theory of stress strain which takes proper account of molecular behavior.

Experimental evidence indicates that the critical process in the breaking of most fibers occurs before the final rupture of primary bonds. The critical process is the pulling out of the loops in long molecules which finally diminishes the cross-section of the fiber until the stress concentrates on individual molecules to the breaking point. The evidence for this point of view is interesting and compelling. The study of mechanical properties of fibers in the light of physical chemical theories gives a deep insight into the structure of fibers and yields information not otherwise obtainable.

PROGRESS REPORT ON RADIATION DRYING OF TEXTILES

By RICHARD H. WILHELM
Chemical Engineering Dept., Princeton University and Textile Research Institute Staff

The drying by radiant energy of water held on the surface of felt and within the structure of the material was described. A comparison with hot air drying is made and smaller thermal resistances, permitting much greater heat flow rates in the case of radiation drying, were noted. The observed proportionality between drying rate and energy input in radiation drying were presented and the effect of air velocity and drying in both modes of drying were discussed. The similarity of moisture gradients in radiation and air drying indicates similar internal moisture transfer mechanisms in the falling rate periods. An experimental comparison between radiation and air drying in these periods and at the same net energy input was presented and indicated only a minor advantage for radiation drying. Comparative experiments between dyed and undyed wool felt were also presented to provide a measure of the importance of surface reflectivity and of radiation absorptivity.

APPLICATION OF X-RAY ANALYSIS TO STRUCTURAL PROBLEMS IN TEXTILES

By ROBERT E. RUNDLE
Textile Foundation Staff

Starch has recently been shown to consist of two components, one highly branched and constituting a major portion of most starches, the other essentially unbranched and amounting to about 25 per cent of the total of most whole starches. These two constituents are quite different in chemical, physical and enzymatic properties. The variation in the two components in their ability to form the starch-iodine complex has provided a means for the analysis of whole starches for the two components, and has demonstrated that the two components differ widely in their behavior with iodine with no region of mixed properties. Thus it is now known that intermediate degrees of branching between the two components are largely non-existent.

The unbranched component has yielded films and fibers, and the acetate of the unbranched component has likewise been shown to form both films and fibers. For the present these do not seem to be important commercially, except possibly in very special cases, but the fibers have been important in structural studies.

From water solution at room temperature the unbranched component crystallizes in a form like that of natural tuber starch granules, and closely related to the form of the natural cereal granules. The fibers have been prepared from the tuber crystalline modification. The fiber axis is 10.6Å, nearly equal to that for cellulose. The unit cell appears to be orthorhombic with a = 16.0Å, b = 10.6Å, c = 9.1Å and eight glucose residues per unit in four chains. Alternate chains run in opposite directions, and in this modifica-

(Continued on Page 539)

Proceedings of the
American Association of Textile Chemists and Colorists

DECEMBER 17, 1945

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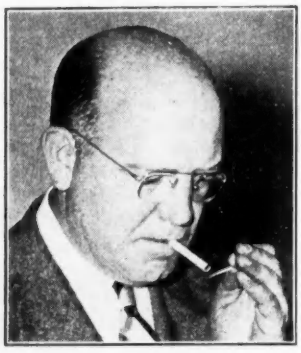

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January 3, 4 and 5, 1946

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Program to Date of the VICTORY CONVENTION

THURSDAY, JANUARY 3

9:00 A.M.
Registration, Foyer of the Grand Ball Room

10:30 A.M. to 12:30 P.M.
Council Meeting, Foyer of the Georgian Room

11:30 A.M. to 5:30 P.M.
Research Sub-Committee Meetings

2:00 P.M. to 5:00 P.M.
Personnel Service

4:00 P.M. to 5:30 P.M.
Reception for Lady Guests

7:30 P.M.
The President's Corporate Membership Dinner-Grand Ball Room
(Dress optional)
Address of Welcome
Emmett J. Driscoll, Chairman, New York Section
"Textile Research of the A.A.T.C.C."
William D. Appel, President, American Association of Textile Chemists and Colorists
"The Consumer's Views on Textile Research"
Lew Hahn, General Manager, National Retail Dry Goods Association

FRIDAY, JANUARY 4

9:00 A.M.
Registration Continued, Foyer of the Grand Ball Room

9:00 A.M. to 12:00 Noon
Personnel Service

9:30 A.M. to 12:00 Noon
Technical Session: "Peacetime Applications of War Developments in Textiles"—Grand Ball Room
Kenneth H. Barnard, National Chairman, Technical Program, American Association of Textile Chemists and Colorists, Presiding

9:30 I—In Relation to Synthetic Fibers
a. Viscose—Dr. F. Bonnet, Director Standards Dept., American Viscose Company
b. Acetate—Dr. Harold DeWitt Smith, Treasurer and Textile Technologist, A. M. Tenney Associates
c. Nylon—George J. Groh, Nylon Fabric Development Manager, Nylon Division, E. I. duPont de Nemours & Co., Inc.

10:30 II—Science—The Key to Textile Testing
Prof. E. R. Schwarz, Professor of Textile Technology, Massachusetts Institute of Technology

11:00 III—The Quartermaster Fights the Weather
William Lee, Chief, Chemical Section, Office of Quartermaster General, Research and Development Division

11:30 IV—Textile Plastics
Dr. D. H. Powers, Director of Textile Development, Monsanto Chemical Company

12:00 Noon to 1:30 P.M.
Lunch for National Officers, Sectional Officers and Guest Speakers

2:00 P.M. to 5:00 P.M.
Personnel Service

2:30 P.M. to 5:30 P.M.
Technical Session: "Reports by Technical Experts returning from Germany"—Grand Ball Room
Thomas R. Smith, Past President, American Association of Textile Chemists and Colorists, Presiding
"Reports on German Dyestuffs and their Application"
Dr. Miles Dahlen, E. I. du Pont de Nemours & Co., Inc.
C. Norris Rabold, Union Bleachery
Elliott Broadbent, Glenlyon Print Works
Henry D. Grimes, American Woolen Co.
P. Thorp

SATURDAY, JANUARY 5

9:00 A.M.
Registration continued, Foyer of the Grand Ball Room

9:00 A.M. to 12:00 Noon
Personnel Service

9:30 A.M. to 12:00 Noon
Research Committee Meeting — Georgian Room
Open to all
Dr. Louis A. Olney, Director of Research, American Association of Textile Chemists and Colorists, Presiding

12:30 P.M.
Lunch, Council and Research Committee, Parlor A

2:00 P.M. to 4:00 P.M.
Intersectional Contest, Georgian Room
Kenneth H. Barnard, National Chairman, Intersectional Contest, Presiding

2:00 P.M.
1. "Evaluation of Fabrics as to their Flammability"
Presented by Charles W. Dorn for the NEW YORK SECTION

2:20 P.M.
2. "Factors which Cause or Prevent Agglomeration of Pigment Particles"
Presented by Raymond W. Jacoby for the RHODE ISLAND SECTION

2:40 P.M.
3. "How Different Types of Dyestuffs Affect the Rate of Deterioration of Cloth Exposed to Weathering"
Presented by Matthew T. Barnhill for the SOUTHEASTERN SECTION

3:00 P.M.
4. "Some Effects of Dry Heat upon the Properties of Nylon Fabrics"
Presented by Arthur W. Etchells for the PHILADELPHIA SECTION

3:20 P.M.
5. "Practical Effects of Stretching Synthetic Yarns"
Presented by John E. Bell for the PIEDMONT SECTION

3:40 P.M.
6. "The Mechanics of Zone Control in Resin Finishing"
Presented by Kenneth P. Monroe for the NORTHERN NEW ENGLAND SECTION

7:30 P.M.
Annual Banquet—Grand Ball Room
Dress Optional
Robert W. Philip, Callaway Institute, Toastmaster
Award of Intersectional Contest Prizes
Kenneth H. Barnard, National Chairman, Intersectional Contest
Olney Medal Award
The Medalist, the Man
Alban Eavenson, Past President, American Association of Textile Chemists and Colorists
The Medalist, the Scientist
Dr. Harvey A. Neville, Head, Department of Chemistry and Chemical Engineering, Director, Institute of Research, Lehigh University
Presentation of the Medal
A. P. Howes, President, Howes Publishing Co., Inc.
Address by the Medalist
Dr. Milton Harris, Director of Research, Milton Harris Associates

JUDGES OF AWARD

Intersectional Contest Papers
Dr. Louis A. Olney
"Chief Justice"

Patrick J. Kennedy—New York Section
Arthur E. Hirst—Rhode Island Section
William B. Griffin—Southeastern Section
Prof. Percival Theel—Philadelphia Section
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Arthur W. Etchells—Philadelphia Section
John E. Bell—Piedmont Section
Walter J. Hamburger—Northern New England Section

Abstracts of Intersectional Contest Papers to be Presented at the VICTORY CONVENTION

"EVALUATION OF FABRICS AS TO THEIR INFLAMMABILITY"

Presented by Charles W. Dorn for the NEW YORK SECTION

The subject of flammability in general and proposed legislation regarding same is discussed. An apparatus developed for testing flammability was designed and tested. Operating instructions and test procedure for use of the Flammability Tester is given. A tentative method for testing flammability of consumer textiles is proposed.

"FACTORS WHICH CAUSE OR PREVENT AGGLOMERATION OF PIGMENT PARTICLES"

Presented by Raymond W. Jacoby for the RHODE ISLAND SECTION

In the 1944 Contest Paper submitted by this section it was shown that agglomeration of pigment particles can cause a substantial loss in color yield. Inasmuch as coloring materials in pigment form are used extensively not only in vat color printing, but in many other ways, the present study was undertaken to determine what factors or properties cause or prevent this agglomeration. The phenomena studied were classified under the following groupings: (1) electrical charge on color particles, (2) hydration of color particles, (3) nature of the colloidal dispersion of the thickener, and (4) effects of finely divided solids. A number of photomicrographs illustrate the paper.

"HOW DIFFERENT TYPES OF DYESTUFF AFFECT THE RATE OF DETERIORATION OF CLOTH EXPOSED TO WEATHERING"

Presented by Matthew T. Barnhill for the SOUTHEASTERN SECTION

The primary purpose of this research was to determine whether different types of cotton dyestuffs have any effect on the rates of deterioration of cloth when such cloth is dyed with these dyes and subsequently exposed to weathering. Dyed and undyed cloth was exposed to weathering simultaneously in three different sections of the country. Procedures for dyeing and other preparations are given. Warp breaks, and in some cases viscosity readings, were used to measure the deterioration of the fabric after weathering. Spectrophotometric calculations were used to show the actual degree of color fading on the samples exposed to weathering at one of the locations. In comparing these samples to the ones exposed at the other two locations, the amount of fading was estimated by matching the faded samples together under a color identification lamp.

Accelerated fading, accelerated weathering, and accelerated aging tests were made on all types of fabric being otherwise tested, as an interesting comparison.

"SOME EFFECTS OF DRY HEAT UPON THE PROPERTIES OF NYLON FABRICS"

Presented by Arthur W. Etchells for the PHILADELPHIA SECTION

Nylon fabrics are improved in handle and appearance by heat treating, becoming softer, more mellow, and having a finished appearance not apparent in untreated materials. Heat treating also renders nylon fabrics more resistant to dimensional change and helps to overcome the tendency to crease when wet processed. Properly heat treated nylon can be dyed in rope form at elevated temperatures without developing crow's feet or dye creases, which are unavoidable in untreated materials.

Nylon fabrics were heated at temperatures from 335°F. to 470°F. for varying times, and measurements were made of the amount of shrinkage; also of the amount of creep, as the fabric tended to return to the original dimensions. Loss in tensile strength and the elongation at the breaking point were also measured. Nylon fabrics were badly damaged by the higher temperatures. This damage was shown by a loss in strength and elasticity, and also by a change in color of the nylon. The greater the amount of damage, the yellower the nylon.

Dyeing trials were made on the heat treated fabrics, using acid and acetate type azo and anthraquinone dyestuffs. Some dyes showed an increased affinity for heat-damaged nylon, while others showed a decrease in dye take-up.

A number of charts are included.

"PRACTICAL EFFECTS OF STRETCHING SYNTHETIC YARNS"

Presented by John E. Bell for the PIEDMONT SECTION

"THE MECHANICS OF ZONE CONTROL IN RESIN FINISHING"

Presented by Kenneth P. Monroe for the NORTHERN NEW ENGLAND SECTION

This paper points out that, with the same resin, striking and useful contrasts in properties of the finished textiles may be obtained by proper control so as to effect zoning of the resin in and on the textile.

Facts about Some of the Speakers at the VICTORY CONVENTION

MATTHEW T. BARNHILL

Mr. Barnhill is superintendent of dyeing at the Avondale Mills, Sylacauga, Ala. He received his B.S. in Chemical Engineering from Georgia Tech in 1932. He has been a member of the A.A.T.C.C. for nine years.

DR. HAROLD DeWITT SMITH

Dr. Smith is Treasurer and Textile Technologist of A. M. Tenney Associates, Inc. He received his Ch. E. from Lehigh University in 1920 and his Ph. D. from the University of Berlin in 1930. He has been active in A.A.T.C.C. affairs for many years, having served as a member of the Research Committee, the Rayon Sub-Committee, the Sectional Committee of the New York Section, and the Program Committee of the New York Section. He is a member of the Board of Directors and Past-President of the Textile Research Instiute, and Honorary Life Member of the Textile Institute in England (a Fellow since 1932, and Honorary Life Member since 1938), an Honorary Member of the American Association of Textile Technologists, and a Member of the Advisory Board, Research and Development Branch, Office of the Quartermaster General, U. S. Army.

Among Dr. Smith's publications, he has contributed to the "Rayon and Staple Fiber Handbook," has published numerous papers in technical journals here and abroad, presented the 1944 Edgar Marburg Lecture of the American Society for Testing Materials—"Textile Fibers—An Engineering Approach to Their Properties and

Utilization," is presently engaged in writing the chapter on acetate rayon for the forthcoming fifth Edition of Matthews' "Textile Fibers."

WILLIAM M. LEE

Mr. Lee is Chief of the Chemical Section, Research and Development Division, Office of the Quartermaster General, U. S. Army. He received his B.S. from Pennsylvania in 1927. He is a member of the A.C.S.

His paper will discuss the need for unusual performance characteristics imposed by climatic extremes. Some of the difficulties of laboratory evaluation will be pointed out.

RAYMOND W. JACOBY

Mr. Jacoby is a Technician with Ciba Company, Inc. He received his B.S. from the Massachusetts Institute of Technology. He has been a member of the A.A.T.C.C. for three years and has had several papers published in the AMERICAN DYESTUFF REPORTER.

DR. HARVEY A. NEVILLE

Dr. Neville is Head of the Department of Chemistry and Chemical Engineering and Director of the Institute of Research at Lehigh University. He has been a member of the A.A.T.C.C. for 12 years. He is also a member of the American Chemical Society, a Fellow of the American Institute of Chemists, a Fellow of the American Association for the Advancement of Science, and a member of S.P.E.E. He has numerous published papers to his credit in various technical journals.

PROF. E. R. SCHWARZ

Prof. Schwarz is head of the Textile Division of the Massachusetts Institute of Technology. He received his S.B. and M.E. from M.I.T. He has been a member of A.A.T.C.C. for over 10 years and is currently a member of the Research Committee. He is also a member of the following societies: American Association of Textile Technologists, American Microscopical Society, Optical Society of America, American Physical Society, honorary member of the American Thread Institute, Fellow of the British Textile Institute, and a Fellow of the American Association for the Advancement of Science.

Among his publications, he is author of "Textiles and the Microscope"; co-author of "Textile Research—A Survey of Progress," contributor to the "American Cotton Handbook," 5th Edition, Matthews' "Textile Fibers," "Mechanical Fabrics," and consultant on Wellington Sears' "Handbook of Mechanical Fabrics." He has also had numerous papers published in various technical journals.

His paper will emphasize the pressing need for intelligent research, involving utilization of the work of modern science as it can be applied to the field of textiles.

DR. DONALD H. POWERS

Dr. Powers is Director of Textile Development for the Monsanto Chemical Company. He received his A.B. from Boston University in 1921, his A.M. from Princeton University in 1923, and his Ph.D. from Princeton in 1924. He has been a member of A.A.T.C.C. for 16 years and has been chairman of the Rhode Island Section, a Member of the National Council and a Member of the Research Committee. He is a Director of the Textile Research Institute, is Chairman of the Textile Section of the 1946 Gibson Island Conferences of the American Association for the Advancement of Science, and is a member of the American Chemical Society and the Society of Chemical Industry. He has had numerous publications in various technical journals.

Dr. Powers' paper will discuss the peacetime applications of plastics and resins developed and improved during the war.

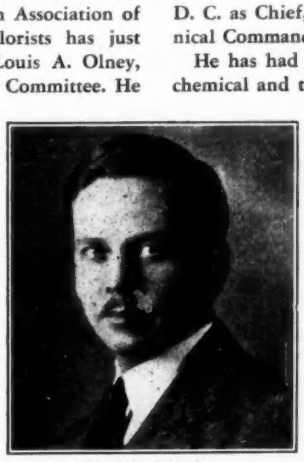
DR. KENNETH P. MONROE

Dr. Monroe is a research chemist with the Fabric Research Laboratories, Inc. He does development work in chemistry of textiles and textile processing. He received his B.S. from the University of Chicago and his Ph.D. from Columbia University. He is a member of Sigma Xi and Phi Lambda Upsilon.

H. W. Stiegler Appointed

DIRECTOR OF RESEARCH

THE appointment of Lt. Col. Harold W. Stiegler as full time Director of Research for the American Association of Textile Chemists and Colorists has just been announced by Dr. Louis A. Olney, Chairman of the Research Committee. He will be located in the A.A.T.C.C. laboratories, at the Lowell Textile Institute, Lowell, Massachusetts.



H. W. Stiegler

Lt. Col. Stiegler graduated from the Lowell Textile Institute in 1918. He later took post graduate work at the Massachusetts Institute of Technology and received his doctor's degree at Northwestern University. He had teaching experience both at the Lowell Textile Institute and at Northwestern University.

Lt. Col. Stiegler enlisted in the Chemical Warfare Service in World War I and worked with W. Lee Lewis during the discovery and development of "Lewisite," the American mustard gas. After the war he became assistant to Dr. Lewis, head of the chemistry department at Northwestern University and worked on further researches on Lewisite and its derivatives. He remained in the Officers Reserve, Chemical Warfare Service, until World War II when he was called to active duty in 1942 in the Office of the Chief, Washington, D. C. as Chief, Protective Division, Technical Command.

He has had a wide experience in both chemical and textile industries in research and administrative capacities. He specialized in organic chemistry, dyes and textile chemicals, finishes, auxiliaries and textile processing. He has been on the research staffs of National Aniline Division, Allied Chemical & Dye Corp., Rohm and Haas Co., Cheney Brothers, and from 1936 to the time of his return to service in 1942, was head of the textile chemicals division, American Cyanamid Company, Research and Development Laboratories, at Stamford, Conn.

Dr. Stiegler is a member of the American Chemical Society, Fellow, American Institute of Chemists, Fellow, American Association for the Advancement of Science and New York Academy of Science. He has been an active member of the A.A.T.C.C. since its organization and has served as a member of the Research Committee, as Councilor and chairman of several sub-committees. He is a member of Sigma Xi, Alpha Chi Sigma and Phi Psi.

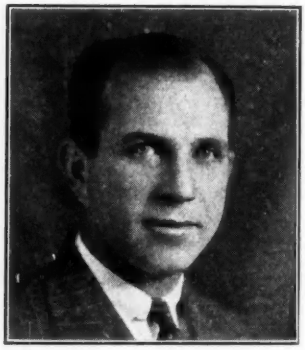
OLNEY MEDAL AWARD

FOR ACHIEVEMENT IN TEXTILE CHEMISTRY
LOUIS A. OLNEY
THE OLNEY MEDAL AWARDED BY THE AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS TO

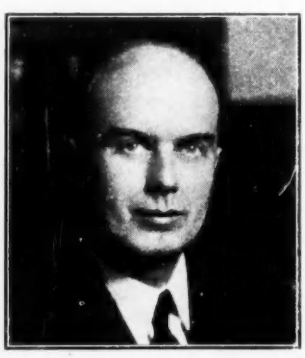
Face and Back of the Olney Medal.

AS announced in our last issue, the Olney Medal for 1945 will be awarded to Milton Harris, Director of Research, Milton Harris Associates, at the Annual Banquet of the Association to be held in the Pennsylvania Hotel, New York City, on January 5th, 1946.

The Olney Medal was endowed by the Howes Publishing Company first, to encourage and to afford public recognition of outstanding achievement in, or contribution to, the field of textile chemistry and, second, as a testimonial to Dr. Louis A. Olney in recognition of his lifetime of devotion and multitudinous contributions to this field.



Dr. Milton Harris, Director of Research, Milton Harris Associates, Olney Medalist for 1945.



Dr. Harvey A. Neville, Head, Department of Chemistry and Chemical Engineering, Director, Institute of Research, Lehigh University, who will discuss the Medalist, the Scientist.

Dr. Louis A. Olney, President-Emeritus of the A.A.T.C.C., recipient of the first Olney Medal, for whom the Medal was named.

The Olney Medal is awarded for outstanding achievement in the field of textile chemistry, which is understood to include the development of chemical agents or processes used in the manufacture of textiles or methods for their evaluation.

In making awards, the Committee need not be confined to the consideration of any one specific achievement or contribution but may in its discretion consider the sum total of various and continued contributions to the field no matter of how long duration. The Citation of the Award drawn by the Committee and accompanying the presentation of the Medal shall set forth clearly the occasion for the Award.

The election of a candidate to receive the Award shall be effected by a Committee of five to be constituted as follows: (Present committee-men are indicated)

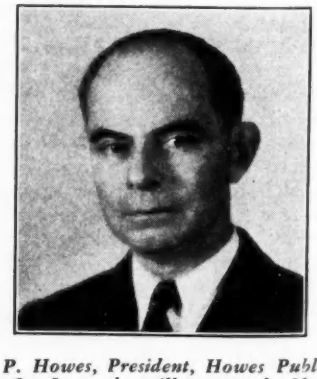
1. The President of the A.A.T.C.C. (William D. Appel)
2. One representative from each of the following three groups:
   - A. A member of the faculty of an educational institution awarding degrees in chemistry (Dr. Harvey A. Neville)
   - B. An employee of a concern manufacturing chemical products used in textile wet processing. (Charles A. Seibert)
   - C. An employee of a concern manufacturing textiles. (Kenneth H. Barnard)
3. A member at large who may be any qualified individual. (Robert W. Philip).

All shall be senior members of the A.A.T.C.C.

Any citizen of the United States of America, whether male or female, may be the recipient of the Award.

Any senior member of the A.A.T.C.C. may nominate a candidate for receipt of the Award by letter addressed to: Olney Medal Committee of Award, care of the Secretary of the Association. This letter shall set forth in detail all facts which qualify the candidate for consideration with particular reference to published works and professional qualifications. Nominating letters must be received by the Committee at least six weeks prior to

Alban Eavenson, Past President of the A.A.T.C.C., who will discuss the Medalist, the Man.



A. P. Howes, President, Howes Publishing Co., Inc., who will present the Medal.

the annual meeting of the Association.

The Olney Medal shall be awarded annually or at such longer intervals as the Committee of Award may elect. The Award shall be made only by unanimous vote of the Committee. In the event that no unanimous agreement is reached, the award shall be passed for the year.

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MEETING, RHODE ISLAND SECTION

THE first meeting of this season of the Rhode Island Section was held on October 26th, at the hall of the Providence Engineering Society. Chairman Sturtevant called the meeting to order at 8:15 p.m. and announced that a nominating committee headed by H. V. King had been named to report a new slate of officers for 1946. He then introduced O. W. Clark, Assistant Manager, Sales Application Lab., Calco Chemical Division, American Cyanamid Company, who spoke on "Some Fundamental Principals of Vat Dyeing." These principals were studied with the usual laboratory tools and with a new instrument which measures the strength of dyebaths by use of the spectrophotometer. The data was illustrated with charts and dyed textiles and split packages. R. W. Jacoby, Technician, Ciba Co., Inc., was the second speaker. His subject "Some Aspects of Vat Dyeing" sought to explain relationship in amount of dyestuff found in dyeings on cotton, plain and mercerized, and on rayon, with the depth of color as seen by the human eye. The various degrees of affinity did not explain the differences in shade while both degree of penetration of the dyes and the optical properties of the undyed and dyed fibers contributed a great deal to a better understanding of these phenomena. After a question-and-answer period, the meeting was adjourned at 10:15 p.m. Both these papers are to be published in the near future. Attendance: 200.

Respectfully submitted,
R. W. JOERGER, *Secretary.*

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MEETING, PHILADELPHIA SECTION

A MEETING of the Philadelphia Section was held on Friday, November 30th, 1945, in the North Roof Garden at the Bellevue-Stratford Hotel.

The meeting was opened by chairman, Arthur W. Etchells, who asked the chairman of the Nominating Committee, R. L. Jones, to submit his report which is as follows:

Officers for the year, 1946—C. R. Baeringer, Chairman; W. F. Fancourt, 3rd, Vice Chairman; A. M. Gordon, Treasurer; A. E. Raimo, Secretary.

Sectional Committee—Dr. E. C. Dreby, T. H. Hart, Prof. P. C. Thiel, E. C. Diehl.

Council—A. W. Etchells, J. P. Conaway, B. C. Bond.

Mr. Etchells then introduced the speaker of the evening, Dr. A. K. Saville, du Pont Co. His subject, "Some Aspects of Nylon Dyeing" was heartily received.

There were 123 present for dinner and 130 for the meeting.

Respectfully submitted,
A. E. RAIMO, *Secretary.*

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MEETING, RHODE ISLAND SECTION

AT the November 23rd meeting of the R. I. Section, the following officers presented by Howard V. King of the Nominating Committee were voted upon and elected:

Councilor for 3 years—Harold B. Sturtevant, Vita-Var Corporation, N. J.

Councilor for 1 year—Allison R. Fletcher, Franklin Process Company, Providence, R. I.

Chairman—George H. Wood, Jr., Apponaug Company, West Warwick, R. I.

Vice Chairman — Robert W. Joerger, Franklin Process Co., Providence, R. I.

Secretary—James C. Shore, U. S. Finishing Co., Research Dept., Providence, R. I.

Treasurer—Robert R. Farwell, E. I. du Pont de Nemours & Co., Inc., Providence, R. I.

Sectional Committee — Emery Richards, Dale Mills, Woonsocket, R. I.; Earl McLeod, Arnold Hoffman Co., Inc., Providence, R. I.; Robert P. Wood, Calco Chemical Division of the American Cyanamid & Chemical Corp., Providence, R. I.; Kenneth J. Broden, Aridye Corporation, Providence, R. I.

Edward R. Schwarz, Professor of Textile Technology in charge of Textile Division, Massachusetts Institute of Technology presented a talk entitled "Electronics in Textile Testing." Professor Schwarz discussed the fundamentals of Electronics and some of the theories involved. He explained Electronics application to Textile Testing apparatus showing slides of newly developed equipment that operates automatically with unprecedented accuracy. His talk interested everyone present and we were honored to have him as our speaker.

Respectfully submitted,
JAMES C. SHORE, *Secretary.*

PERSONNEL SERVICE

Employers and members of the Association seeking employment can make appointments at the Victory Convention for interviews between noon on Thursday, January 3, and noon on Saturday, January 5.

Those seeking positions should file their qualifications well in advance of the meeting. Blanks can be obtained from the Secretary, P. O. Box 28, Lowell, Mass. Two photographs, approximately 2 by 2½ inches, will be required.

EMULSIONS
and their Applications to Textiles*

HARVEY A. NEVILLE

Head, Department of Chemistry and Chemical Engineering, Lehigh University

NATURE OF EMULSIONS

AN emulsion is a dispersion of one liquid as fine droplets in another liquid medium. Liquids of related chemical character are generally miscible—that is, form true solutions; to form an emulsion a pair of immiscible liquids is required. *Water*, the most common liquid, is usually, though not necessarily, one of the pair; the other contrasting member of the pair is described by the term *oil*, meaning a liquid immiscible with water. It is immediately apparent that from a given pair of liquids two different kinds of emulsions can be prepared. These are commonly referred to as the *oil-in-water* type and the *water-in-oil* type. The conditions which determine the type of emulsion obtained, and their contrasting properties will be referred to later.

MISCIBILITY OF LIQUIDS

The characteristic properties of the liquid state and the factors which control the degree of miscibility of liquids are of great importance to an understanding of the formation and behavior of emulsions. Mutual solubility of liquids depends upon similarity of chemical composition and molecular structure. The extent to which hydrogen-bonding can occur largely determines the solubility of another liquid in water. That solubility of liquids is closely related to molecular structure is illustrated by comparing the solubilities of isomeric forms of a compound. Thus the solubilities in water of the four isomers of butyl alcohol vary from about 8 per cent to infinity as shown in Table 1.

TABLE 1. SOLUBILITIES OF SOME ISOMERS
Solubility in 100 Parts of Water

Butyric acid (normal)		infinite
Butyric acid (iso)	20	(20°)
Butyl alcohol (normal) $C_2H_5CH_2CH_2OH$	9	(15°)
Butyl alcohol (secondary) C_2H $CHOHCH_3$	12.5	(20°)
Butyl alcohol (iso) $(CH_3)_2CHCH_2OH$	10	(15°)
Butyl alcohol (tertiary) $(CH_3)_3COH$		infinite

When two liquids are incompletely miscible it is usually possible to find a third liquid which will serve as a common solvent or "solution bridge." In a similar manner certain liquids such as pine oil often serve as an *introfier* to aid in the emulsification of one liquid in another.

* Paper presented at meeting, Philadelphia Section, Oct. 19, 1945.

EMULSIFIABILITY OF LIQUIDS

Emulsions of the O/W type are more common and generally more useful, for reasons which will appear. It seems fairly safe to make the unqualified statement: "Any liquid (immiscible) can be emulsified in water." This implies, of course, that the substance can exist as a liquid somewhere in the temperature range between the freezing point and the boiling point of water. Waxes and resins can be emulsified in water as well as oils, by operating at proper temperatures.

LIQUID—LIQUID INTERFACES

Emulsions, like other types of finely dispersed or colloidal systems exhibit an extensive interface or high ratio of phase-surface to volume or weight. It is the conditions of surface energy and electrical charge at this interface which predominantly characterize an emulsion. In any approach to the theory of emulsions attention must be focussed upon this boundary film.

Two pure liquids will not form a stable emulsion. One or more additional substance must be provided to serve as the emulsifying agent. These agents must concentrate at the boundary between the liquid phases to form a kind of membrane or envelope around the dispersed droplets.

The most important recent advances in our knowledge of emulsions have resulted from intensive studies of the formation and properties of these films themselves. These investigations,[1] conducted principally at Cambridge University, England, have demonstrated that the properties of emulsions can be controlled and varied to a surprising degree by relatively slight modifications in the composition and structure of the interfacial film. Thus, keeping the proportions of oil and water constant, emulsions may be prepared which range in viscosity from mobile fluids to thick greases by varying a component of the film which represents less than one-half of one per cent of the composition. Even the type of emulsion may be reversed by similarly slight additions which greatly change the structure of the film.

Some of these film studies are illustrated in Table 2 where it appears that while neither cholesterol (oil-soluble) nor sodium cetyl sulfate (water-soluble) is an effective emulsifying agent, a combination of the two produces an excelleent emulsion. These two substances were known to associate in a fixed molecular ratio to form stable films at an air/water and at an oil/water interface. The conditions of surface energy and surface charge resulting from a complex formed by a water-soluble component and an oil-soluble component are favorable to a stable oil-in-water emulsion.

It is further apparent from Table 2 that the molecular structure of each component is very important to the formation of a suitable film. Thus cholesterol may be replaced by elaidyl alcohol (the trans isomer), but not by oleyl alcohol (the cis isomer); and sodium elaidate may serve as the water-soluble component, but not its isomer, sodium oleate.

It is of particular practical interest to note that the viscosity of the emulsion can be greatly increased by replacing cholesterol by elaidyl alcohol or cetyl alcohol in an amount representing only 0.43 per cent of the total weight of the emulsion. Ordinarily, such an increase in viscosity would result only from a very great increase in the concentration of the dispersed phase—oil, in this instance.

Proteins may serve as the water-soluble component of emulsion films. For example, a dilute solution of gelatin is a poor emulsifier for mineral oil, but

TABLE 2. TWO-COMPONENT FILMS AS EMULSIFYING AGENTS

10 c.c. Nujol	*40 c.c. H_2O*	*Remarks*
140 mg Cholesterol		No emulsion
	75 mg Na-cetyl-SO_4	v. poor emulsion
140 mg Cholesterol	75 mg Na-cetyl-SO_4	excellent em. (liq.)
140 mg oleyl alcohol (cis)	75 mg Na-cetyl-SO_4	v. poor emulsion
140 mg elaidyl alcohol (trans)	75 mg Na-cetyl-SO_4	v. good em. (viscous)
140 mg cetyl alcohol	75 mg Na-cetyl-SO_4	v. good em. (grease)
140 mg cetyl alcohol	250 mg Na stearate	Stability good
140 mg cetyl alcohol	250 mg Na elaidate (tr)	Stability good
140 mg cetyl alcohol	250 mg Na oleate (cis)	Stability poor
140 mg Cholesterol	250 mg Na oleate (cis)	Stability v poor
140 mg Cholesterol	250 mg Na elaidate	Stability good

TABLE 3. POSITIVELY CHARGED EMULSIFYING AGENTS AND INVERSION OF EMULSIONS

	Emulsifying Agent	*Interfacial Film*	*Emulsion Type*
1	Lissolamine (pH 7)	None	None
2	(1) + cholesterol (pH 7)	Liquid + charge	Oil in water
3	(2) + Na_2SO_4	Liquid + charge	Oil in water
4	(2) + Na_3PO_4	Solid, neutral	Water in oil
5	(2) + tannic acid (pH 3)	Solid, neutral	Water in oil
6	Heptadecylamine (pH 7)	None	No emulsion
7	Heptadecylamine HCl (pH 2)	Liquid + charge	Oil in water
8	(7) + Na_3PO_4	Solid, neutral	Water in oil
9	(7) + Na_2SO_4	Solid, neutral	Water in oil
10	(7) + tannic acid (pH 2)	Liquid + charge	Oil in water
11	(7) + Na tannate (pH 7)	Solid, neutral	Water in oil
12	Heptadecylamine + 3N HCl	Solid, neutral (Multilayer)	Water in oil

if cholesterol is added to the oil a good emulsion may be produced. Other oil-solutes such as fatty acids and alcohols may be used for this purpose in conjunction with gelatin. Similar complexes formed between proteins and synthetic wetting agents or detergents have recently been discussed by Lundgren.[2]

The use of cationic substances in stabilizing emulsions is illustrated in Table 3. Lissolamine, cetyl trimethyl ammonium bromide, is too soluble in water and heptadecylamine is too soluble in oil to form stable films at the oil-water interface. Lissolamine can be held in the film by associating with cholesterol to form a complex and heptadecylamine can be brought from the oil phase to the interface by forming its hydrochloride whose ionized group will be strongly polar. In general, for O/W emulsions two long-chain molecules are required to form a satisfactory interfacial film. Inversion of O/W emulsions to the W/O type can be brought about by the use of polyvalent ions which neutralize the charge on the interfacial film and convert it from a liquid to a solid type of film. It is apparent that the type of uncharged film required to stabilize W/O emulsions can be produced by interaction of a single species of long-chain molecules in the oil phase with polyvalent ions of opposite charge in the water phase.

TABLE 4. CONDITIONS FOR STABLE EMULSIONS

	O/W
1	Stable complex, 2 components
2	Very low interfacial tension
3	Excess wate-soluble component
4	Condensed LIQUID film
5	Ionized film (charged droplets)
	W/O
1	Uncharged film
2	Solid (rigid) film

The conditions and properties of interfacial films which are conducive to the formation of stable emulsions of the two types are summarized in Table 4.

EMULSIFICATION

In producing an emulsion mechanical work must be performed. One of the bulk liquids must be broken up into droplets and the boundary between the two liquids must be greatly increased. This work is done against the molecular cohesive forces of the liquid to be dispersed and the interfacial tension between the two liquids. The type of mechanical action or agitation is important. A shearing rather than a beating effect is required. It is desired to break up and disperse the one liquid phase while avoiding disruption of the other liquid phase which is to serve as the continuous medium. A too violent agitation is undesirable because it breaks up both liquid phases. Consistent with this view, it has been found that intermittent shaking or agitation is more effective than continuous action of the same kind in producing an emulsion. Actually, if the conditions for formation of the interfacial film are properly provided for, surprisingly little mechanical action is required. Under ideal conditions the emulsification is said to be spontaneous.

ADVANTAGES OF EMULSIONS

Many practical advantages may result from the use of emulsions in various applications. Whenever a liquid material, or a material which is liquefiable by melting or solution in non-aqueous solvents, is to be applied as a coating, bonding agent, lubricant, solvent, etc., consideration should be given to the possibility of using the material as an emulsion in water. Likewise the emulsification of water in a hydrophobic liquid system may result in a better control of consistency or flow and a more effective utilization of the material.

The following outline suggests some of the potential advantages afforded by emulsions; in any particular application a combination of these may obtain:

1. *Economy of Materials.* If water is used as the medium it replaces volatile solvents and a considerable saving of expense results. This is illustrated in the use of emulsions for paints and other protective coatings, and in the application of resins and plastics as adhesives. Due to dilution in emulsion form, the material may be spread more uniformly and over a larger area than when used directly. This is an important consideration for economy in the use of emulsions as road sprays for laying dust, as textile lubricants, and as cutting oils. In the use of cutting-oil emulsions the cooling effect upon the tool due to the high heat of vaporization of water is an especially desired result.

2. *Control of Desired Effect.* Most processes of Nature and many operations of industry take place in aqueous media. In these systems oil-like materials can only be applied in emulsified form. Fat is carried as an emulsion in the blood stream to the cells of the body. The young of mammals first receive their essential fat ration in milk, an emulsion. The digestibility of fat is greatly increased by subdivision into the fine droplets of an emulsion. This finds application in gravies, sauces, mayonnaise, and other oil dressings. The digestibility of cow's milk or cream is further improved by homogenization.

Fat droplets in the blood stream adsorb bacterial toxins, and the intravenous injection of oil emulsions is in practice as a treatment of toxaemic conditions. Fat-soluble vitamins and other hydrophobic therapeutic agents may likewise be injected in the form of emulsions. Subcutaneous injection of an oil or fat in any other form might be either injurious or ineffective.

In sizing, lubricating, or finishing textiles, and in the softening of leather by the fat-liquor after tannage, emulsions of oil-in-water are used. The degree of penetration and softening effect is here controlled by the particle size and concentration of the emulsion, by the duration of the treatment, and by the electrical conditions.

Insecticidal and fungicidal sprays for use in horticulture are commonly oil-in-water emulsions. Complete coverage of the foliage by an oil film would be injurious to the plant; a controlled concentration is necessary to obtain the intended effect without causing damage.

3. *Modification of Properties.* When paints are applied indoors, or when non-aqueous solutions of coating and bonding agents are employed in plants, the volatile solvents constitute a serious fire hazard. The substitution of water as the diluent, by means of emulsification, eliminates this condition. In addition to flammability, the solvent vapors from such operations may have objectionable odors or may be toxic to some degree. Again, the use of an O/W emulsion, where feasible, would remedy these effects.

Many oils used in pharmaceutical and food preparations have an unpleasant taste. By making the oil the discontinuous phase of an emulsion, the droplets of oil will not come into direct contact with the nerve ends in the taste buds of the mouth. The addition of desired flavors to the external water phase will further mask any unpleasant taste of the system. An oily or greasy texture in ointments for the skin may be avoided by emulsification, as in the preparation of cosmetic creams.

The viscosities of oils, greases, waxes may be modified as desired by suitable emulsification. As shown in Table 2, the nature of the emulsifying agent has a marked influence upon the fluidity of an emulsion. Heavy greases or waxes, softened by melting or by means of a small amount of solvent, may be dispersed in water to produce a very fluid emulsion. By contrast, an oil of low viscosity may be converted to a thick paste or grease by emulsification. This result may be accomplished as either an O/W or W/O emulsion.

4. *Effects of Oil-Water Interface.* The formation of an emulsion provides an extensive interface or boundary surface between the oil and water phases. Thus one cubic centimeter of oil dispersed in droplets one micron in diameter would have a total surface area of about six square meters; a quart of oil, in the same degree of dispersion, would provide a total surface of about one and one-third acres. Such an extension of interface would enormously increase the rate and capacity of *adsorption* by an oil.

Many chemical changes occur more readily, or perhaps exclusively, at an interface. Thus the rate of saponification of a fat by means of an aqueous solution of an alkali will be greatly enhanced by emulsifying the fat in the aqueous solution. The hydrolysis of fats by Twitchell agents is similarly affected. The digestion of fats in the animal body is accomplished in an emulsion system. The polymerization of unsaturated compounds in an emulsion to produce synthetic rubbers and other high polymers in the field of plastics is common industrial practice. In many of these systems the catalyst for the chemical reaction is dissolved in the aqueous phase and can be effective only at the oil-water interface.

The electrokinetic properties of a dispersion can often be used advantageously in practical applications. The droplets of oil in an O/W emulsion may be electrically neutral, positively charged or negatively charged depending upon the character of the emulsifying agent. The control of the sign and intensity of this charge provides the essential condition of electrical attraction or repulsion of the oil droplets with reference to a charged surface upon which they are to be deposited or from which an oil is to be removed by emulsification. Electrophoresis of charged emulsion particles and electrodeposition of these particles can be accomplished readily. A commercial process has been developed for coating conducting surfaces or articles with rubber by anodic deposition from rubber latex.

UNDESIRABLE EMULSIONS

Naturally it should be pointed out that emulsions are sometimes formed where they are definitely not wanted. In such instances a knowledge of how to prevent or break down the troublesome emulsion is of primary interest. Oil-field emulsions have received particular attention with this objective. The emulsification of oil lubricants in steam engines and turbines, the formation of rather stable emulsions in steam distillation and in the alkali refining of oils are other examples of unwelcome appearances of liquid-liquid dispersions.

WIDER USE OF EMULSIONS

Emulsions now find applications in many fields; it is probable that if their properties and possible advantages were better understood, they would be even more widely employed. In the textile field it would appear that the use of emulsions would be particularly appropriate and logical in view of the many wet operations which are performed and the common characteristic which all textile fibers, filaments and fabrics have — namely, a high ratio of surface to volume or weight. Whenever it is desired to add an oil, wax or resin to a textile material or to remove such substances from a fibrous structure the possibilities of emulsions or emulsification should be given thorough consideration.

SUMMARY

1. Any pair of immiscible liquids can be emulsified—either one in the other.

2. Conditions at the interface of the two liquids determine the type, charge viscosity and other properties of the emulsion.

3. For O/W emulsions a two-component complex is more effective than a single emulsifying agent. One component should be oil-soluble, the other water-soluble.

4. Choice of emulsifiers permits oil droplets in water to be electrically positive, negative or neutral; droplets of W/O type are uncharged.

5. Type of mechanical agitation is important in preparing emulsions; too violent action may cause them to "break."

6. Numerous potential advantages of emulsions are indicated for various applications.

REFERENCES

[1] Schulman and Rideal, Proc. Roy. Soc. B *112*, 29, 46 (1937).
Schulman and Stenhagen, Proc. Roy. Soc. B *126*, 356 (1938).
Cockbain and Schulman, Trans. Far. Soc. *35*, 716 (1939).
Schulman and Cockbain, Trans. Far. Soc. *36*, 651 (1940).
[2] Lundgren, Textile Res. Jour. *15*, 335 (1945).

• CALENDAR OF COMING EVENTS •

Victory Convention under auspices of New York Section, Hotel Pennsylvania, New York City, January 3rd, 4th and 5th, 1946.

Council Meeting, Hotel Pennsylvania, New York City, January 3, 1946.

Meetings of Sub-Committees of Research Committee, Hotel Pennsylvania, New York City, January 3, 1946.

President's Corporate Membership Dinner, Hotel Pennsylvania, New York City, January 3, 1946.

Research Committee Meeting, Hotel Pennsylvania, New York City, January 5, 1946.

Intersectional Contest, Hotel Pennsylvania, New York City, January 5, 1946.

Award of Olney Medal and Awards of Intersectional Contest Prizes, Annual Banquet, Hotel Pennsylvania, New York City, January 5, 1946.

Meeting, Philadelphia Section, January 18, 1946.

Meeting, Rhode Island Section, Providence Engineering Society Hall, 195 Angell Street, Providence, R. I., January 25, 1946.

Meeting, New York Section, Downtown Athletic Club, 19 West Street, New York City, February 15, 1946.

Meeting, Mid-West Section, Bismark Hotel, Chicago, Ill., February 16, 1946.

NOTICE TO SECRETARIES OF LOCAL SECTIONS:

Please advise the National Secretary or the American Dyestuff Reporter of your meeting dates for the 1945-1946 season as soon as available.

♦ ***Victory Convention, January 3, 4 and 5, 1946*** ♦

PLAN NOW TO ATTEND THE

Victory Convention

Hotel Pennsylvania, New York City

January 3, 4 and 5, 1946

DON'T MISS THESE FEATURES!

PERSONNEL SERVICE
Thursday, Friday and Saturday

EXHIBITS
Thursday, Friday and Saturday

CORPORATE MEMBERSHIP DINNER
Thursday evening

TECHNICAL SESSIONS
Friday morning, Friday afternoon

GENERAL RESEARCH MEETING
Saturday morning

INTERSECTIONAL CONTEST
Saturday afternoon

ANNUAL BANQUET
OLNEY MEDAL AWARD
CONTEST AWARDS
Saturday evening

MAKE ROOM RESERVATIONS NOW!

PURCHASE TICKETS IN ADVANCE!

Under Auspices of The New York Section

♦ **Victory Convention, January 3, 4 and 5, 1946** ♦

UNEMPLOYMENT REGISTER

Members of this association, who are without employment, should forward a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the American Dyestuff Reporter any vacancies which may occur in their business.

NOTICE TO EMPLOYERS

Personal Histories and Employment Records of the following applicants are on file at the office of the American Dyestuff Reporter. Prospective employers may examine them without obligation.

Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive.

A-2

Education—Graduate, Lowell Textile Institute, B.T.C., 1933.
Experience—Experienced as textile chemist, chemist-spotter, agricultural chemist and U. S. Army inspector on cotton, rayon, woolens and worsteds. Seeks research or control position with future. New England preferred.
Age 34; married; references.

A-3

Education—Ph.D. degree in chemistry, University of Lausanne, Switzerland. Knowledge of French, German and Russian.
Experience—Eleven years as assistant chemist and chemist in charge of laboratory with a large bleaching, dyeing, printing and finishing plant in New England. Experience in dyeing and printing cotton, rayons. Research. Five years with a textile testing laboratory of a mail order house in Midwest. Three years with an industrial research laboratory in vicinity of Boston.
Position desired in a laboratory in the East. References.

A-4

Education—B.T.C., Lowell Textile Institute, 1936.
Experience—One year as assistant to general manager in production of rubber coated textiles. Four years as assistant chemist working on the development and plant control of a number of rubber products including footwear, molded products, industrial rolls, tubing, etc. Seeks position as textile chemist or colorist or allied work.
Age 31, married; references.

A-B-1

Education—Bradford Durfee Textile School.
Experience—Eight years in dye laboratory testing dyes, matching shades, research work, trouble shooting combined with practical work on dyeing and bleaching. Two years as superintendent of dyeing, bleaching and drying. Had charge of laboratory and purchase of all materials for processing. Five years as dyer on cotton, rayon, silk and nylon. Seeks position as dyer, superintendent of dyeing and bleaching, or charge of dye laboratory.
Age 37, married, three children; references.

A-B-C-D-1

Education—High school graduate; Lowell Textile evening school (elementary chemistry, quantitative analysis, textile dyeing and chemistry).
Experience—2½ years as dry and wet-finish hand; 4 years as foreman of bleaching, dyeing and finishing on cotton piece goods; 2 years in army air forces, served as instructor.
Seeks position in chemical sales or technical service.
Age 28; married; references.

A-B-C-F-3

Education—High school and full apprenticeship.
Experience—Practical Dyer and finisher. Long experience on specialties for men's wear trouser trade in cottons, cotton and rayon mixtures and cotton and Celanese. Is disposing of interests in progressive finishing plant and seeks position as manager, assistant manager or technical advisor. Thoroughly understands requirements of Quartermaster, especially on herringbone construction.

A-D-1

Education—B.T.C., Lowell Textile Institute, 1922.
Experience—Three years as assistant chemist and chemist in bleachery. Twelve years as chemist with leather company, establishing laboratory, and handling purchasing of dyestuffs and chemicals. Seven years as sales engineer representing chemical company in New England for the textile and leather trades. Most recently associated with textile chemical company on sales and technical service of dyestuffs, soaps and chemical specialties. Seeks position as technical salesman.
Age 45; married, two children; references.

B-1

Education—2 years high school; 4 years dyeing, 2 years chemistry, Philadelphia Textile School.
Experience—16 years experience as a dyer in one concern. Experienced on auto cloth, wool, cotton, silk, rayon and mixtures of all kinds. Broad experience in field gained by experience in one large, wel-known mill qualifies this man, who is available for immediate employment as a dyer.
Age 37; married; 3 children; references.

B-C-1

Education—Lowell Textile Institute.
Experience—Many years of varied experience in charge of bleaching, dyeing, mercerizing, and finishing of cotton goods and rayon. Has a thorough knowledge of manufacturing, both technical and practical. Besides operation and processing, experience covers personnel management, supervision of building construction, machinery installation, production and costs. Seeks position as plant superintendent, technical engineer or consultant.
Age 65, married; references.

B-D-1

Education—Textile dyeing, college chemistry.
Experience—Over twenty-five years experience as dyer on various types of fibers and fabrics, dyestuff salesman, technical advisor on application of mildewproof and waterproof compounds and dyeing of casein fabrics. Seeks position as technical advisor and trouble shooter in viscose or protein fibers or as salesman of dyes or auxiliary compounds.
Age 47, married, four children; references.

B-D-3

Education—B.T.C., Lowell Textile Institute, 1939.
Experience—One year's experience as assistant dyer on wool felt hat bodies and raw stock, chemical control and research. Five years' experience as inspector of textiles for Q.M. depot, quality control and expediting in the finishing of cotton textiles. Seeks position as assistant superintendent, foreman, or in technical sales or research.
Age 28, married, three children; references.

C-1

Experience—Experienced as assistant finisher, finisher and superintendent of finishing since 1923. Experience on automobile cloth, boucle overcoatings, high grade men's wear worsted, low grade woolens, medium grade plaid-back overcoatings, fleece finish overcoatings. Bolivias, kerseys, medium-grade men's piece dye suitings, uniform cloth, flannels, ladies' dress goods and coatings, government serge and elastique fabrics, marine wool, flannel shirtings.
Age 37; married, 3 children; references.

Abstracts of Papers Presented at the Meeting-in-Print of the Division of Cellulose Chemistry of the AMERICAN CHEMICAL SOCIETY

1. X-RAY DIFFRACTION STUDIES OF ORIENTATIONS ESPECIALLY FOLLOWING HIGH COMPRESSION AND IMPREGNATION OF WOOD CELLULOSE. G. L. Clark and J. A. Howsmon, Department of Chemistry, University of Illinois.

The swelling of wood and ramie fibers by pyridine and morpholine was studied. The agreement of calculated values of the lattice dimensions of the untreated and swelled specimens indicated that no compound formation between the cellulose and the molecules of the swelling agent had taken place. The swelling of wood by both pyridine and morpholine was classified as intermicellar swelling.

The technique of microradiography was applied to the study of impregnated wood. An improved experimental procedure for making microradiographs of wood was developed. The microradiographs were found to be characteristic of the wood and the distribution of the impregnant.

A comparison of the relative effectiveness of alcohol-soluble and water-soluble resins as impregnants was possible by this technique. The alcohol-soluble resins were found to be more evenly distributed on the cell walls of the wood than water-soluble resins and, therefore, probably more efficient in decreasing dimensional changes with changes in humidity.

The orientation of cellulose crystallites in wood which had been subjected to heat and pressure was studied and compared with the orientation in the untreated wood. In general, compression of wood seems to decrease the preferred orientation of the cellulose crystallites, while the preferred orientation of heated wood was observed to increase as a result of the heat treatment.

Absolute correlation between the changes in orientation and the physical properties of the wood was not possible because of the lack of sufficient data.

The use of a recording microphotometer equipped with a rotating stage is not recommended for routine use when few measurements are to be made. If complete distribution curves are desired, this instrument is superior to those previously employed.

2. THE ACTION OF ULTRAVIOLET LIGHT UPON CELLULOSE. HELIUM VERSUS NITROGEN AS IRRADIATION ATMOSPHERE. POSTIRRADIATION EFFECTS WITH CELLULOSE TRIACETATE. E. Heuser and George N. Chamberlin, Institute of Paper Chemistry.

Ultraviolet irradiation of cellulose in a helium atmosphere produces the same changes as in nitrogen, which would seem to rule out the possibility that the changes earlier observed in nitrogen resulted from the hydrolysis of cellulose by nitrogen oxides in the presence of water. Samples irradiated in helium undergo the postirradiation effect during storage in oxygen to much the same extent as samples which had been irradiated in nitrogen. Likewise, helium may be used instead of nitrogen for inhibiting the postirradiation effect.

In contrast to cellulose, the reducing power of cellulose triacetate is not increased by irradiation in nitrogen, obviously because the hydroxyl groups are protected by acetyl, the latter remaining unchanged on irradiation in nitrogen. However, on irradiation in oxygen, far-reaching deacetylation occurs and copper number and uronic acidity increase considerably. Under these conditions, the same reactions would seem to be involved as when cellulose itself is irradiated in oxygen, the increases in copper number and acidity being in part a result of the oxidation of deacetylated hydroxyl groups. The appearance of uronic acid carboxyl shows that hydroxyl groups in the 6 positions are oxidized.

The effect which irradiation in nitrogen exerts upon cellulose triacetate suffices to induce a pronounced post-irradiation effect during storage in oxygen, which seems to show that in cellulose itself the hydroxyl groups are not essentially involved in that irradiation reaction which leaves the glycosidic linkages in a condition unstable to oxygen. Oxygen allowed to act upon cellulose triacetate with ultraviolet light excluded, but under exactly the same conditions as when ultraviolet light is used, produces no change in D.P., copper number, and uronic acid.

The behavior of cellulose triacetate which has been irradiated in an oxygen atmosphere towards storage in nitrogen and in oxygen is much the same as previously observed with cellulose itself under the same conditions.

3. THE BEHAVIOR OF SULFURIC ACID IN THE PREPARATION OF CELLULOSE ACETATE. Carl J. Malm, Leo J. Tanghe, and Barbara C. Laird, Eastman Kodak Co., Rochester, N. Y.

The amount of combined sulfur has been determined at all stages in the manufacture of cellulose acetate, including pretreatment, acetylation, and hydrolysis. Very little combined sulfur was found during the pretreatment, but after the addition of the acetic anhydride the sulfuric acid combined quantitatively with the cellulose in the intermediate stages of the acetylation. At the point where substantially all the hydroxyl groups had been esterified, the combined sulfur content began to drop gradually, and as the reaction time was extended beyond the point where it is normally interrupted to initiate the hydrolysis stage, it continued to drop, being replaced by acetyl.

The combined sulfur dropped very rapidly during the addition of water for hydrolysis. The lowering of the sulfur content was sharply influenced by the temperature and the rate of addition of water.

The amount of sulfuric acid catalyst was varied over a 32-fold range, and the amount of combined sulfur at the completion of the esterification and during hydrolysis was roughly proportional to the concentration of sulfuric acid used.

When part of the sulfuric acid was neutralized at the start of hydrolysis, the amount of combined sulfur in the product was determined by the amount of soluble sulfate (SO_4^{--}) present during hydrolysis.

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T. R. I. MEETING

(Continued from Page 526)

tion (CH_2OH) group on the glucose units are *trans* to each other.

When precipitated with alcohols, fatty acids, and other long, linear molecules with dipoles, the unbranched component forms unusual and interesting complexes. The X-ray evidence indicates that the chains form helices, with the complexing agent inside the helices. The starch-iodine complex is of this form. It appears that the helix possesses a very high dipole and binds the dipolar, linear complexing agents by dipole forces. Iodine is bound because it is very highly polarizable.

In this modification the starch chains

have the (CH_2OH) group *cis* to each other. Apparently there is fairly free rotation about the glucosidic bond between glucose residues.

Fibers have not been prepared in the helical form, but such preparation is probably possible. The properties of fibers formed such unusual molecules should be interesting.

The type of binding of polar molecules by unbranched starch through dipolar forces may not be unlike the type of interaction between a fiber and a dye. It is hoped that X-ray analysis can shed some further light on this problem.

The unbranched component of starch is preferentially and tightly bound to cellulose. On the other hand, it has been reported that the branched component is highly preferable in paper sizing. It seems likely that this has to do with the ease of crystallization, or at least orientation, of the unbranched component on cellulose. The similar fiber spacings suggest an oriented behavior. The type of behavior of the two components is an interesting problem with respect to fiber sizing with starch. It is likely that X-ray structure studies will be important in providing a solution.

TRADE NOTES • NEW PRODUCTS

From The Reporter Files

TEN YEARS AGO

At the 15th annual meeting of the A.A.T.C.C. held in Chattanooga, Tenn., on December 6th and 7th, it was reported that the following officers of the association had been elected: *President*, William H. Cady, *Vice-President*, Elmer C. Bertolet, *Councilors-at-Large*, Harold M. Chase and Arthur E. Hirst. Officers re-elected were: *Vice-President*, Arthur R. Thompson, Jr., *Treasurer*, William R. Moorhouse, *Secretary*, Harold C. Chapin. At the annual banquet Arthur R. Thompson acted as toastmaster and introduced, with appropriate musical numbers by the orchestra, the following speakers: E. D. Bass, Mayor of Chattanooga; Dr. Louis A. Olney, President Emeritus and Dr. Robert E. Rose, Retiring President.

A report of the meeting of the New York Section of the A.A.T.C.C. held at the Elm Golf Club on November 22nd indicated that Dr. Harvey A. Neville of Lehigh University was the speaker. Discussion was led by Jerome Alexander.

TWENTY YEARS AGO

Plans were prepared for an 80-foot addition to the Textile Building at North Carolina State College. One hundred thousand dollars was to be expended on enlarging the building and purchasing additional equipment.

The fifth annual meeting of the A.A.T.C.C. opened on Friday morning, December 4th, at the Copley Plaza in Boston. Nearly 100 persons visited various educational and industrial establishments by motor bus during the day. An Open Forum was conducted Friday evening. The annual business meeting was held Saturday morning at which the following officers were re-elected: *President*, L. A. Olney, *Vice-Presidents*, William D. Livermore and E. H. Killheffer, *Secretary*, Walter E. Hadley, *Treasurer*, Winthrop C. Durfee, *Councilors*, Walter M. Scott and William R. Moorhouse. A technical session followed at which 350 were present. A further technical session was held in the afternoon. Alan A. Claflin presided as toastmaster at the annual banquet held Saturday evening at the Walker Memorial.

At a meeting of the Rhode Island Section of the A.A.T.C.C. held on December 1st, Dr. Herty spoke on "A Decade in the Development of the Key Industry."

The fourth annual meeting of the Synthetic Organic Chemical Manufacturers was held on Friday morning, December 11th, at the Hotel Commodore, New York. Speakers at the annual banquet were: Henry T. Claus, editor of the Boston *Evening Transcript*, George Eastman of the Eastman Kodak Company, and Dr. Charles H. Herty, president of the association.

TWENTY-FIVE YEARS AGO

It was reported that Elvin H. Killheffer, Vice-President of the Newport Chemical Works, Inc., would sail on December 29th from San Francisco for an extended tour covering the principal centers of dyestuff consumption in the Far East.

• RETURN TO AMERICAN VISCOSE

S. Reed Anthony, MacLean Williamson and C. David Reich, who have been on military leave, returned to American Viscose Corporation on December 3. All three men will be connected with the rayon staple fiber sales division, which is located in the company's New York office. Mr. Anthony was a Lieut. Commander in the Navy; Mr. Williamson was a Captain in the Army; and Mr. Reich was a 2nd Lieutenant in the Army.

• "WATER-THINNED" EMULSIONS

Sherwin-Williams Company, Pigment, Color and Chemical Division, have announced a new line of "oil-in-water" pigment resin finishes for pad-dyeing fabrics. It is stated that the water-thinned emulsion requires no expensive and inflammable solvent thinners. Extenders and high-speed mixers are unncessary and the problems of color exhaustion and migration are claimed to be eliminated entirely. It is stated that there is less time lost in preparing for a run or in changing colors between runs. Equipment is simply washed down with water between operations to clean-up.

Unlike present pad-dyeing operations, the Sherdye Pigment-Resins require no equipment tie-up for matching colors. The last yard of material is said to be dyed to an identical intensity with the first yard. It is further claimed that with these "oil-in-water" emulsions, dyers can combine the beauty, tensile strength and washfastness of the finest pigment dyes with easy, fast preparation, processing and clean-up. Solvent fumes are said to be eliminated completely.

Pre-proven in the Sherwin-Williams laboratories, Sherdye "water-thinned" colors are said to have proven their economy and effectiveness in actual production runs. Sherdye colors are now available through the Sherwin-Williams Company, 295 Madison Ave., New York 17 or their southern agents Southern Dyestuff Corporation, Charlotte, N. C.

• PERMANENT CELLULOSE FINISHES

The Dexter Chemical Corporation has just issued a reprint of an article by Sidney Edelstein, its Technical Director. This article is entitled: "New Developments in Permanent Cellulose Finishes." Copies are available by writing to the Dexter Chemical Corporation, 819 Edgewater Road, New York 59, New York.

• DU PONT APPOINTMENT

Dr. Ernest B. Benger, general assistant manager of the Technical Division of the Rayon Department of the Du Pont Company, has been appointed manager of the division succeeding M. Du Pont Lee, who was recently named general consultant in the Engineering Department, the company announced recently. A. E. Buchanan, Jr. continues in his present capacity as assistant manager of the Technical Division.

• TEST FABRICS AVAILABLE

Fabrics that are used in the dyestuff, textile and allied industries for research and test purposes are available from Testfabrics, 1243 Lenox Avenue, Plainfield,

N. J. These fabrics are prepared in such a manner that they are ready for use. They may be of standard construction or may be specially designed to serve a particular purpose such as the six-fiber fabric that has been adopted by the A.A.T.C.C. for wash and perspiration tests.

The firm is headed by Werner Klaas who is a graduate of the Cantanol Gymnasium of Zurich, Switzerland, where he also attended the textile school. After spending several years in textile mills and dyeing plants in practical work, he came to the United States in 1928. From that time on, until 1945, he was employed by Stehli & Co. His business of supplying test fabrics started accidentally and for quite some time was just a hobby. Firms using his services recommended him further until the hobby grew to the point where it was necessary for him to devote his entire time to the business.

• SONNEBORN PERSONNEL CHANGES

In a move designed to place its technical and production departments on a peacetime footing to meet the problems of reconversion at its plant in Nutley, N. J., L. Sonneborn Sons, Inc., has named Irving Silverman to the newly created post of production manager and appointed A. Moscowitz to succeed Mr. Silverman as chief chemist. The changes were announced in a bulletin issued by Philip Dettelbach, plant manager.

Effective December 1, 1945, Mr. Silverman will assume responsibility for the direction of all production and shipping operations at the Nutley plant. Mr. Moscowitz will take charge of technical matters relating to all divisions at the Nutley laboratory, including the textile chemicals research activity in which he had formerly specialized.

Co-ordination of technical and production details between the plant and Sonneborn's general offices in New York City will be handled by Dr. Erich Meyer, director of the Department of Industrial Research.

• TEXTILE PERSONNEL PLAN

Firms wishing to hire technicians or women experienced in other phases of textile work are now urged to locate suitable personnel through the aid of the N. Y. Home Economics in Business Group and its newly appointed agency, Maude Lennox Personnel Service, 630 Fifth Avenue, New York City.

The announcement, made recently by Miss Blanch Stover, chairman of the Group and editor of Practical Home Economics, said that the distinct aim of the new plan is to get the right person in the right job. Chairman of the Group's Vocational Guidance Committee is Miss Eloise Voss of the Celanese Corporation of America and the committee member representing textile interests is Miss Bernice Bronner of the American Standards Association.

• TEXTILE DEAN, CLEMSON COLLEGE

The appointment of Dr. Hugh M. Brown as dean of the School of Textiles at Clemson College, the A & M College of South Carolina, has been announced by Dr. Robert Franklin Poole, president of the institution.

Hugh M. Brown

A member of the Clemson faculty since 1927, Dr. Brown has recently returned to the campus following a 27-month leave of absence to work with the British-Canadian-American radar project devoted to the development of navigational aids.

Professor Robert K. Eaton has been acting dean of textiles here since 1943.

A native of Nebraska, Dr. Brown received his undergraduate degree from the University of Denver and was awarded his Ph. D. degree by the University of California.

As former head of the Clemson College physics department, Dr. Brown developed a teaching staff and instructional facilities, including the construction of much teaching apparatus, which enabled the strength of the Clemson department of physics to become recognized throughout the South.

• CONFERENCE REPORT AVAILABLE

Progress made during the war in the improvement of military textiles was reviewed at a conference on Quartermaster Textile Research held at the National Academy of Sciences in Washington, D. C., on October 25, 1945. Problems which have pressed for solution, the manner in which these problems were attacked, and noteworthy accomplishments were described. Areas in which further research is known to be needed were outlined. Present at the conference were: Textile members of the Advisory Board of the Research and Development Branch of the Office of The Quartermaster General and representatives of other organizations in the textile industry who have assisted in Quartermaster textile research during the war.

In order that everyone in the industry who is interested in textile research may have an opportunity to study the papers given at the conference and therefore be able to assist to the extent of their ability in this aspect of national defense, the proceedings of this important conference are being published under the sponsorship of The Inter-Society Council for Textile Research in a well-illustrated booklet. This will be informative to all persons interested in textile developments. The continued interest of the textile industry in the solution of basic military problems will be essential if the post-war textile research program of the Quartermaster Corps is to be successfully carried forward.

This report, entitled "Proceedings of the Conference on Quartermaster Textile Research," is being published and distributed by Textile Research Institute, which is a member of the Inter-Society Council. Copies are $1.00 each, and may be had by writing to Textile Research Institute, Inc., 10 East 40th Street, New York 16, New York.

• OFFICERS, UNION CARBIDE

Fred H. Haggerson, President, Union Carbide and Carbon Corporation announced recently the election by the Board of Directors of the following officers of the Corporation:

Dr. Joseph G. Davidson, Vice-President—Chemicals Division
Stanley B. Kirk, Vice-President—Industrial Gases Division
James W. McLaughlin, Vice-President—Plastics Division
William J. Priestley, Vice-President—Alloys and Metals Division
John H. Rodger, Vice-President—Railroad Division
Arthur V. Wilker, Vice-President—Carbon Division
H. Earl Thompson, Vice-President—Engineering
Robert J. Hoffman, Vice-President—Industrial Relations
Morse G. Dial, Secretary-Treasurer

All of the new officers of the parent Corporation are officers of important subsidiary companies. Dr. J. G. Davidson is President of Carbide and Carbon Chemicals Corporation; S. B. Kirk is President of The Linde Air Products Company; J. W. McLaughlin is President of Bakelite Corporation; W. J. Priestley is President of Electro Metallurgical Company; J. H. Rodger is President of The Oxweld Railroad Service Company; A. V. Wilker is President of National Carbon Company, Inc.; H. E. Thompson is Vice-President and Director of Carbide and Carbon

Chemicals Corporation and Bakelite Corporation; R. J. Hoffman is Director of various subsidiaries and President of Union Carbide and Carbon Research Laboratories, Inc.; and M. G. Dial is Secretary-Treasurer of many of these subsidiary companies.

● TENNESSEE SALES OFFICE

Tennessee Eastman Coporation has announced that on December 1 it will establish New York City sales offices at 10 East 40th Street.

A. M. Tenney Associates, Inc., located at the same address, will continue to act as sales representatives for Eastman acetate rayon and staple fiber.

Sales of Tennessee Eastman's plastic, Tenite, and its cellulose esters in the New York area will be in charge of William L. Searles. F. L. Bume will handle the line of Eastman Acetate Dyestuffs, and sales of other Tennessee Eastman chemicals in this district will also be made from the new offices. R. C. Tuttle will direct the corporation's advertising.

The plant and main offices of Tennessee Eastman Corporation are located at Kingsport, Tenn. As a subsidiary of Eastman Kodak Company, it produces in addition to cellulose acetate yarns, plastics and dyes, all the cellulose esters which form the base of Kodak safety motion picture and X-ray film, as well as certain chemicals used in industry.

● CHEMICAL FOR NYLON PROCESSING

The research laboratories of Victor Chemical Works, producer of elemental phosphorus and phosphate chemicals, recently announced successful tests of a new chemical compound in the alkyl phosphate family which, it is claimed, will speed up the processing of nylon by eliminating an expensive and time consuming operation as the yarn goes through the dyeing process, and will eliminate spoilage from tangling and bring about greater evenness and stability of color.

The improved processing made possible by the chemical, known temporarily as Phosphate No. 12, will contribute materially to the efforts of nylon producers and converters to lower the cost of nylon yarn to the purchasing public, according to August Kochs, president of Victor.

The team of Victor research chemists responsible for the development and its practical application in eastern textile dyeing plants included Dr. Howard Adler, chief chemist, W. H. Woodstock, assistant chief chemist, and Dr. Ben Toubes.

The chemical is a dye carrying penetrant which simplifies the dyeing of nylon thread, Mr. Kochs said. It may be used in Franklin equipment thus eliminating the necessity for installation of new machinery for its use and making it possible for nylon processors to meet the current demand for nylon materials, he said.

In addition to providing even penetration of the nylon thread or yarn under treatment, it is claimed, the new phosphate is foam free, an objective toward which chemists have been working for many years.

The Victor process does away with two major steps—skeining and rewinding.

Tests have included batches up to 200 one-pound nylon cakes in existing dyeing plant equipment, it was said. In a solution of approximately 1,250 pounds of water and dye, only four-tenths of one per cent of Phosphate No. 12 was required.

The new chemical compound has been found stable in the presence of both acids and alkalis and is non-ionic or neutral in electrical charge. It was found compatible with other constituents of the dyeing bath in a variety of experiments.

Phosphate No. 12 is being produced in a semi-works unit at the Chicago Heights Victor plant, but it is anticipated that a rapidly developing demand will necessitate immediate construction of large scale manufacturing facilities, plans for which already have been completed by the Victor engineering department.

Sidney M. Edelstein, who, as noted in our November 19th issue, is the newly appointed technical director of the textile chemical division of Dexter Chemical Corporation, New York City. Mr. Edelstein received his bachelor's degree in chemistry from Massachusetts Institute of Technology. He served the Dixie Mercerizing Co. of Chattanooga, Tenn., as chemist; was research associate of the American Association of Textile Chemists and Colorists with headquarters at the University of Chattanooga; served as general manager of the Georgia organization of Lamede, Inc.; and was director of research with the Hart Products Corporation for the past six years. He is a member of the American Association of Textile Chemists and Colorists, the American Chemical Society, the American Association for the Advancement of Science, the History of Science Society and Phi Beta Delta fraternity of M.I.T.

● VICE PRESIDENT, DAN RIVER

John M. Hughlett of New York, recently appointed General Sales Manager of Riverside & Dan River Cotton Mills, Inc. was made a vice president of the corporation at a meeting of the Board of Directors in Danville, Va., George S. Harris, president and treasurer, announced recently.

● 25th ANNIVERSARY, SILICATE P's & Q's

The December issue of "Silicate P's & Q's" marks the silver anniversary of this publication of the Philadelphia Quartz Co., 121 S. Third Street, Philadelphia 6, Pa. During the first year there were only five issues, but subsequently it has appeared on the first of each month.

One or two issues each year are devoted to patent reviews, another issue covers miscellaneous uses, space is given regularly to the discussion of physical and chemical characteristics of their products, new developments of importance are reported, and new laboratory findings on uses and new uses in industry are discussed.

During the life of the publication it has had but two editors: the first was James G. Vail, a vice-president, and the present one is C. H. Jeglum.

● ELECTROCHEMICALS DEPT. CHANGES

Appointment of Samuel G. Baker as assistant general manager of the Electrochemicals Department of the Du Pont Company was announced recently by F. S. MacGregor, general manager. Mr. Baker, who has been director of the Electroplating Division of the department, took his new position December 1.

Milton Kutz, who has been acting assistant general manager, becomes a special assistant to Mr. MacGregor, effective the same date.

● RESEARCH ON SYNTHETIC FIBERS

War pressure greatly stimulated research work on synthetic fibers and the results of this work should be apparent in the not too distant future, Graeme G. Whytlaw, of American Viscose Corporation's Textile Research Department stated at the meeting of the Textile Society of Canada, Eastern Division, at Montreal on Saturday, November 24.

Mr. Whytlaw described the wartime uses of viscose and acetate rayon yarn in tire cords and fragmentation bomb, cargo and aerial delivery parachutes and stated that the yarns used in this equipment should be of real value for civilian purposes where their strength will permit the making of finer, more sheer fabrics.

It is expected that rayon staple fiber will show the biggest advances poundagewise in the near future, Mr. Whytlaw said. With staple fiber there is provided the first common denominator of the three most widely-used spinning systems — cotton, worsted and woolen. This is the first time

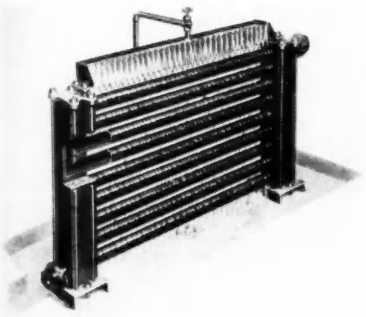
that a single type of fiber fits all three systems by a comparatively simple change in length and size of staple.

"The merging of thought and techniques brought about by this common denominator is already beginning to be evident, Mr. Whytlaw stated. "In our hemisphere, rayon staple fiber has won its spurs, not as a substitute, not as an adulterant, but on sheer merit alone. The wide range of most attractive and satisfactory fabrics produced from 100 per cent rayon staple or in blends with other fibers has won a permanent place in our textiles and the market is far from being saturated."

Non-textile uses of man-made fibers have an interesting future and in many cases will pioneer in new fields, according to Mr. Whytlaw. Some of these fields are plastic laminates and non-woven fabrics, and a large number of experiments are now being carried out on V-belts, fire hoses and asbestos yarns and rovings.

• "KARBATE" SECTIONAL CASCADE COOLER

"Karbate" Sectional Cascade Coolers, designed for the efficient cooling of corrosive liquids and gases, are now available from National Carbon Company, Inc., New York. A complete cooler assembly is quickly and easily erected from four standard items in five pipe sizes and is adaptable to a wide range or process requirements. Construction is such that additional units, or sections, may be added just as one would stack office filing cases.

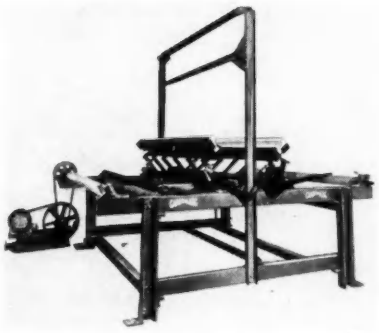


"Karbate" Sectional Cascade Cooler

Having the well known properties of "Karbate" impervious graphite materials such as corrosion resistance, high heat transfer rate, resistance to thermal shock and freedom from corrosion scale formation, "Karbate" Sectional Cascade Coolers are recommended by the manufacturers for service in practically all acids, caustics and organic solvents at pressures up to 75 lbs. per square inch and temperatures up to 338°F. (170°C). Minor changes in the method of applying the cooling water permits the handling of gases well in excess of this temperature.

• NEW TYPE SINGEING UNIT

The Carbomatic Singer is now available to the textile industry. It is stated that the greatest "bugaboo" in singeing operations has been the necessity of passing materials through the singer several times in order to do a complete singeing job, at a great loss in man hours and at a great expense in operating costs. Now, with the new Carbomatic Singer, it is claimed that one pass is all that is required in most instances, and both sides of the cloth or material are processed simultaneously.



The Carbomatic Singer

Carbomatic Singers are designed to solve individual problems, governed by actual requirements that must be met by each mill, as to width of materials, their type and weight, etc. These units are so constructed as to make possible the processing of several widths of material on the same unit, with necessary controls incorporated as an integral part of same. Variable speed control is also made possible, thus enabling the singeing of lighter or heavier goods at the proper speeds.

It is stated that these new singers are fully automatic, and their operation is absolutely fool-proof. Flame is automatically shut off if the machine is stopped for any reason whatsoever.

Full details and information on these units may be obtained by writing to the Carbomatic Corporation, 117 West 63rd Street, New York 23, New York, requesting bulletin SU-1045.

• SERVICE MEN RETURN TO CIBA

The main office of the Ciba Company in New York City has announced the return of Major Clement O. Stevenson, Staff Sergeant Robert L. Horney, and First Lieutenant Chester M. Kopatch, who entered the service in 1942 and have recently been released from the Army. They will resume their former positions as salesmen for Ciba Company, Inc. Major Stevenson was awarded both the Bronze and Silver Stars for heroism in battle. He and Sergeant Horney are connected with the Southern branch office of the Ciba Company with headquarters at 1517-23 Hutchison Avenue, Charlotte 1, N. C.

Lieutenant Kopatch will return to the New England branch office located at 157 Federal Street, Boston 10, Mass.

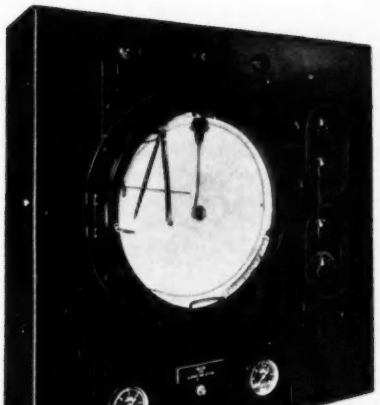
• JOINS PHILADELPHIA QUARTZ

Dwight L. Turner has joined the sales staff of the Philadelphia Quartz Company, Philadelphia, Pa., manufacturers of sodium silicates and potassium silicates. Mr. Turner, whose home is in Greensboro, N. C., is assigned to the Southern territory. He is a graduate chemist of the North Carolina State University and recently received his honorable discharge from the Army Air Corps.

• FOXBORO CYCLELOG CONTROLLER

For batch-type processes and other operations where rate of temperature increase or decrease must be controlled, as well as the actual processing temperature and duration, The Foxboro Company, Foxboro, Mass., has developed the CycleLog Controller, now available as a standard item in the company's line of instruments for measurement and control.

The name CycleLog was adopted as expressing the instrument's unique function, in controlling and recording all the steps of a complete process cycle. No timecam or supplementary instruments are employed. CycleLog control is said to be completely automatic, according to whatever schedule is predetermined by adjustments of four setting knobs on the instrument panel.



The Foxboro CycleLog Controller, for complete temperature control, including rate of temperature rise, for batch-type Processes.

In batch dyeing, for example, the CycleLog Controller will bring the bath temperature up from any starting point,

regardless of daily or seasonal variations, to the desired holding point, and do this at any desired rate of rise from 1 to 8° F. per minute. It will then hold the bath at exactly the correct temperature for the correct period of time, and then shut off the heat supply, and signal the operator that the cycle has been completed. By reference to the instrument chart and its notations, any cycle can be exactly duplicated as desired, in any similar plant and regardless of season.

• D.C.A.T. ANNUAL MEETING

The Drug, Chemical and Allied Trades Section of the New York Board of Trade held its 55th Annual Meeting and Election at the Drug and Chemical Club, 85 John Street, on November 20th, with over 150 executives present. Guy L. Marsters (vice-president of Norwich Pharmacal Company), Chairman of the Section, presided, and presented his annual report which reviewed the activities of the Section during the past year.

The Membership Committee, under the Chairmanship of Lloyd I. Volckening (president of The Ivers-Lee Company) reported the greatest year of membership expansion in the history of the Section. A total of 117 firms had been added to the roster during the past year, bringing the membership of the Section to the all-time high of 618 of the leading manufacturers and distributors in the drug, chemical and allied trades throughout the country.

Annual reports were also presented by the Treasurer, Robert B. Magnus (Vice-president of Magnus, Mabee & Reynard, Inc.), Legislative Committee Chairman, Carl M. Anderson (assistant to the president, Merck & Co., Inc.), the Acting Secretary, Miss Helen L. Booth, and Washington Representative, Robert C. Hilldale.

E. T. T. Williams, (chairman of the Executive Committee of Becton, Dickinson & Co.) was elected as Representative of the Section to the Board of Directors of the New York Board of Trade. By unanimously adopting the report of the Nominating Committee presented by its Chairman, Ralph E. Dorland (Dow Chemical Company), the following Executive Committee was elected to serve for the coming year:

Harold M. Altshul, Ketchum & Co., Inc.
Carl M. Anderson, Merck & Co., Inc.
William H. Berg, The Borden Co.
Carle M. Bigelow, Calco Chemical Div., American Cyanamid Co.
Hugh S. Crosson, McKesson & Robbins, Inc.
James DeCesare, White Laboratories, Inc.
Frank G. Fanning, N. I. Malmstrom & Co.
William F. George, Hooker Electrochemical Co.
Harold C. Green, L. Sonneborn Sons, Inc.
Frank M. Head, Whelan Drug Co.
Philip B. Hofmann, Ortho Pharmaceutical Corp.
Joseph F. Kelly, Hagerty Bros. & Co.
Elvin H. Killheffer, E. I. duPont de Nemours & Co., Inc.
Robert B. Magnus, Magnus, Mabee & Reynard, Inc.
James H. Murray, Parke, Davis & Co.
Charles A. Pennock, Wm. R. Warner & Co.
Harold D. Pomeroy, G. S. Stoddard & Co., Inc.
John P. Remensnyder, Heyden Chemical Corp.
Fred J. Stock, Chas. Pfizer & Co.
Lloyd I. Volckening, The Ivers-Lee Co.

• JOINS I.T.T.

The Institute of Textile Technology has appointed Dr. Burt P. Johnson to its research staff as head of the biology division.

Burt P. Johnson

Dr. Johnson worked for a year at the Citrus Experiment Station in California as a National Research Fellow in the Biological Sciences. He continued his research and teaching at Wisconsin, the University of Montana and the University of Arkansas. At the last institution Dr. Johnson was assistant professor of agronomy from 1936 to 1939. In 1939 he accepted a position with the Goodyear Tire and Rubber Company, from which company he comes to the Institute.

One of Dr. Johnson's most recent research interests has been in following all of the biological factors in the growth of the cotton plant to the final processing of the cotton fiber to tire cord.

• P. T. I. FUND

The Philadelphia Textile Institute Foundation $2,000,000 Building Fund has passed its first half-million mark, it was announced recently by Alban Eavenson, National Campaign Chairman. Subscriptions to the Fund now total $516,901, represented by nearly 500 corporate and individual contributions. The campaign to raise the balance of the Fund continues through December.

Companies which have contributed $10,000 and over to date include:

Continental Mills, Inc., Philadelphia, Pa.	$25,000
Rosemary Sales, Division of Simmons Company and Associates, New York, N. Y.	25,000
The Kent Manufacturing Co., Clifton Heights, Pa.	25,000
Goodall-Sanford, Inc., Sanford, Mass.	25,000
J. P. Stevens & Co., Inc., New York, N. Y.	25,000
Wm. H. Grundy Co., Inc., Bristol, Pa.	21,000
Gibbs Underwear Company, Philadelphia, Pa.	15,500
United Merchants Foundation, Inc., New York, N. Y.	12,000
Althouse Chemical Co., Reading, Pa.	10,000
James Lees & Sons Company, Bridgeport Pa.	10,000
The Nolde & Horst Co., Reading, Pa.	10,000
Swift & Company, Inc., Chicago, Ill.	10,000
Collins & Aikman Corp., New York, N. Y.	10,000
Delta Finishing Co., Philadelphia, Pa.	10,000
Scholler Bros., Inc., Philadelphia, Pa.	10,000
Charles J. Webb Sons Co., Philadelphia, Pa.	10,000
Mohawk Carpet Mills, Amsterdam, N. Y.	10,000

Readers are invited to submit problems to the Open Forum

• OPEN FORUM •

59—We understand that there is a process of washing natural silk and perhaps other yarns by means of soap foam and that it has been found that this process was impoved by controlling the size of the bubbles. We are desirous of learning more about this process, particularly as to its practicability and any criticisms which might be made of it.—*S & N*

Answer

In the year 1920 I started to work for Clavell & Lindenmeyer at Basel, Switzerland. This company was boiling off silk skeins in soap foam. The process was patented by Schmidt Co., a dyeing concern in Basel (no longer in business).

The skeins were hanging on supporters in the upper part of a box. Near to the bottom were placed porous clay cylinders through which the air entered and caused the heated soap solution to foam. The results were very good. The goods were protected from chafing, the time cut and the amount of soap kept low.

Piece goods of silk were not boiled off in foam. The Schmidt Co. used in their plant a patented procedure to phosphate and rinse pieces to be loaded in foam. Similar clay pipes were used and the foam was generated by the addition of "Saporin."

As all these processes were performed over 20 years ago I am convinced the respective patents elapsed.

Dr. M. Bergman

A minimum of $2.00 will be paid for each reply to questions that are published.

Proceedings of the
American Association of Textile Chemists and Colorists

DECEMBER 31, 1945

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Some Fundamental Principles of VAT DYEING*

O. W. CLARK
Calco Chemical Division,
American Cyanamid Co.

IN THIS post war period a much more extensive use will be made of vat dyes. Many textile dyers and chemists with little previous experience in this field quickly will have to master their properties and dyeing methods and experienced vat dyers who have concentrated during the past several years on OD shades and the relatively few dyes used in their production, now may have to refresh their knowledge of the properties and application methods of the full range of vat dyes used to meet the civilian demand for countless shades on yarn and fabrics containing various fibers. In addition, newly devised methods of vat dyeing may be more effectively used if the vat dyer has a sound fundamental knowledge of vat dyes and their behavior. In view of these facts, a review of some fundamental principles of vat dyeing seems appropriate at this time.

SOURCES OF PUBLISHED DATA

There is a vast amount of very valuable information in the literature and it should not be neglected by the vat dyer who is interested in equipping himself with a sound technical background. The color cards, dyeing manuals, and technical bulletins issued by dye manufactures provide considerable basic data. Further information is available in the textile magazines, especially in the *American Dyestuff Reporter* and in the English *Journal of the Society of Dyers and Colourists*. To those who read these publications upon receipt and file them away, and then at a later date go back through the files to review a specific subject, it often is somewhat startling to see how much useful information is available which was not properly appreciated during the original perusal of the publication. The Year Books of the A.A.T.C.C., contain useful bibliographies of books and magazine articles. One of the latest and best books is the 1942 Edition of "Dyeing with Coal Tar Dyestuff," by Whittaker & Wilcock. A brief selected bibliography on vat dyeing is appended to this paper.

SUMMARY OF CONTENTS

The remainder of this paper will discuss some fundamental characteristics of vat dyes and their influence in application processes. Data and illustrations are selected from investigations carried on in the Calco Research and in the Calco Application Laboratories. In addition to the more common tools available in most laboratories, use has been made of an instrument, known as the "Dye-ometer," which in conjunction with the "Spectrophotometer" permits the accurate study of the reduction and dyeing phenomena throughout their duration.

The subjects to be discussed are:

1. General dyeing characteristics of Vat Dyes.
   - A. Rapid Rate of Exhaust.
   - B. High Degree of Exhaust.
   - C. Low Rate of Diffusion within the Fiber.
2. Methods of Modifying and Controlling the Dyeing Behavior of Vat Dyes.
   - A. Temperature Manipulation.
   - B. Levelling Assistants.
   - C. Mechanical.
3. The effect of Temperature on the Reduction Rate of Vat Dyes.
   - A. Reduction at Normal Temperatures.
   - B. Reduction at High Temperatures
   - C. Practical Methods of Dyeing based on High Temperatures.
4. Stripping Vat Dyeings.
   - A. Influence of Temperature.
   - B. Influence of Assistants.
5. The Effect of Various Procedures on the Vat Dyeing of Calcoloid Blue BLD on packages.

1. GENERAL DYEING CHARACTERISTICS OF VAT DYES

As a class, the vat dyes exhaust rapidly at the recommended dyeing temperatures. They are dyed in the presence of large amounts of electrolytes due to the caustic and hydro required for solution. Rapid exhaust is not conducive to level dyeing.

Figures 1, 2 and 3 show the Rate of Exhaust curves for three widely used vat dyes. The curves are plotted for three percentages of dye at the normal dyeing temperature of 120°F., dyed on greige cotton yarn in a fiber to bath ratio of 1:20. The rapid rate of exhaust of these dyes is typical for the vat dye group, and

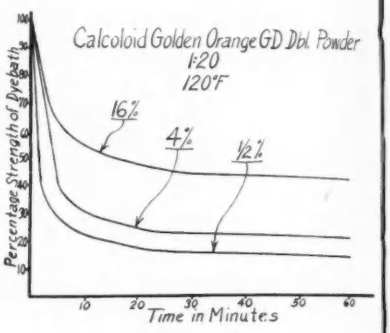


Figure 1

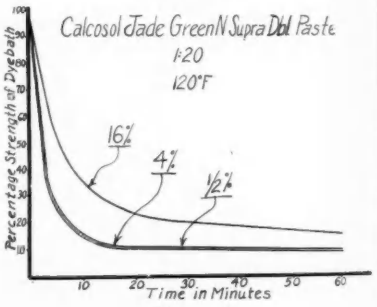


Figure 2

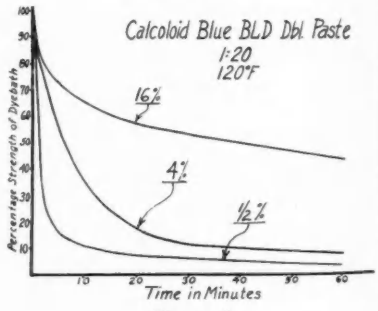


Figure 3

it is clearly apparent why difficulty is often experienced in dyeing light shades levelly.

Another factor, the degree of final exhaust, is also an important factor. Thus with the ½% shade of Blue BLD, practically all the dye was on the fiber in 5 minutes and there was little dye left in the bath which might eventually reach and bring to shade any of the less easily accessible and hence lightly dyed fibers.

* Presented at meeting, Rhode Island Section, October 26, 1945.

In the case of the 16% shade, the large amount of dye remaining in the bath would reach and dye to shade any of the less easily accessible fibers.

A third factor, the rate of diffusion of the dye within the fiber and in and out of the fiber, is also of importance in level dyeing. A dye may exhaust rapidly and unevenly; there may be little dye left in the bath, eventually to bring lightly dyed fibers to shade; but if the dye can migrate in the fiber and from fiber to bath to fiber; then a level dyeing may finally result. The selection of dyes with a high rate of diffusion is often of importance, especially when a difficult problem in dyeing viscose rayon must be solved and retardation of the rate of exhaust and the degree of exhaust fails to produce a level dyeing.

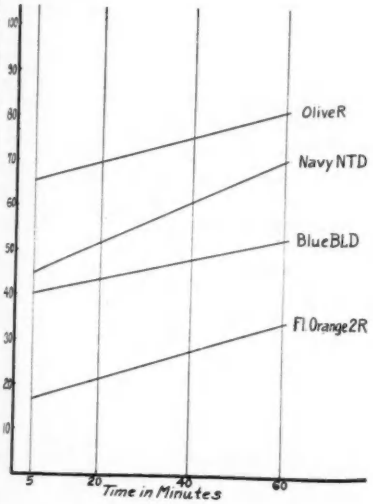
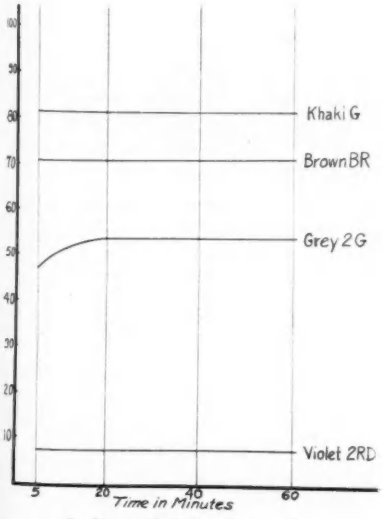
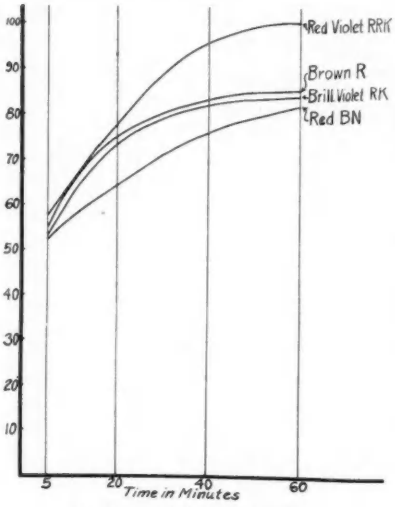


Figure 4

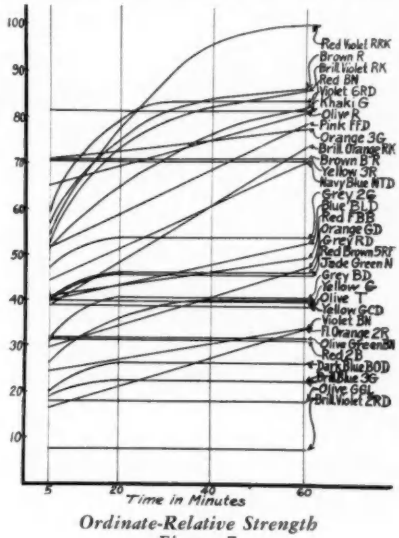


Ordinate-Relative Strength
Figure 5

Figures 4 to 10 inclusive, show the behavior of certain vat dyes when applied to viscose skeins. The basic method used to secure the data was described by Boulton & Morton of Courtauld's Lt'd in 1939 in the *Journal of the Society of Dyers & Colourists* and they gave data secured under one specified set of conditions. A different set of conditions was used to secure data in this paper.



Ordinate-Relative Strength
Figure 6



Ordinate-Relative Strength
Figure 7

Temperature—140°F.

Ratio of fiber to bath—1:20.

Caustic Soda concentration—¾ oz. per gallon.

Sodium Hydrosulfite concentration—¾ oz. per gallon.

Percentage of dye—12% single strength paste.

The procedure was as follows: A leuco solution of dye was prepared and divided into four equal portions. Into each bath

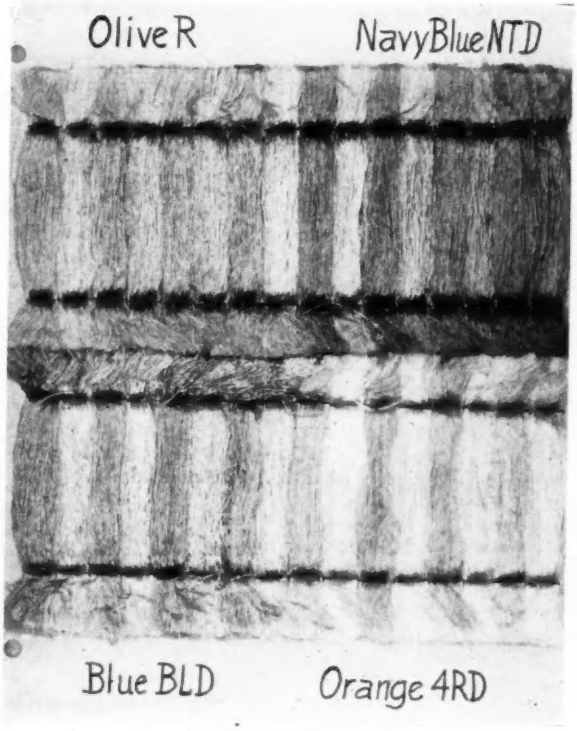


Figure 8

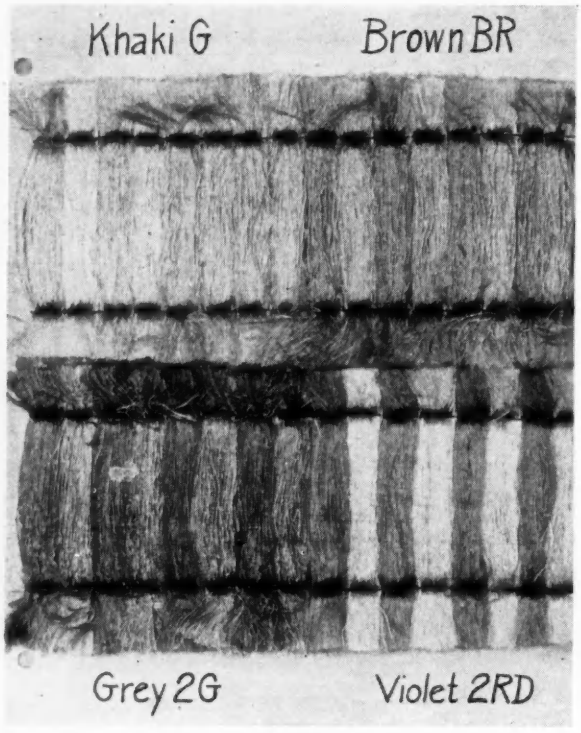


Figure 9

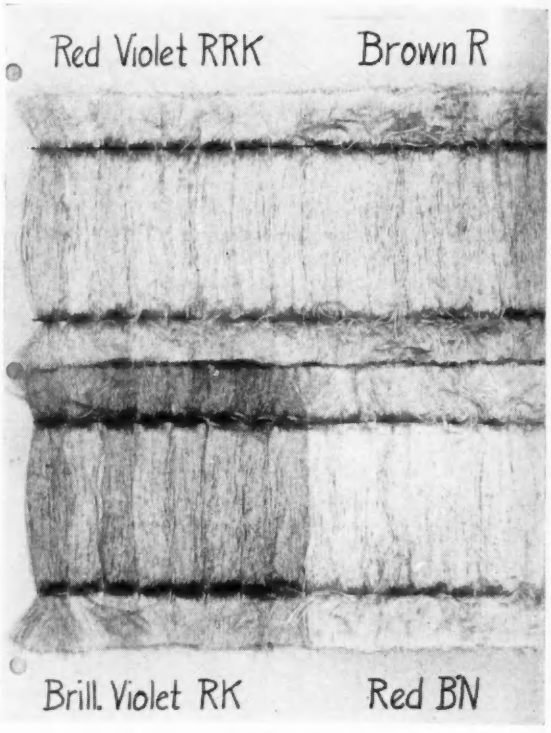


Figure 10

a viscose skein was entered and one minute later a second skein was entered into each bath. At the end of 5 minutes both skeins were removed from bath No. 1, at the end of 20 minutes both skeins were removed from bath No. 2, at the end of 40 minutes both skeins were removed from bath No. 3, and at the end of 60 minutes both skeins were removed from bath No. 4. The dyeings were completed and evaluated on the Spectrophotometer, arbitrarily assigning the value 100 to the first skein from bath No. 1, and expressing the strength of the other skeins as a percentage of this value.

The curves show the relative strength of the pairs of skeins and indicate the tendency of a dye to level out when one skein has an initial start of one minute over another. They show the combined effect of rate of exhaust, degree of exhaust and rate of diffusion.

2. METHODS OF MODIFYING AND CONTROLLING THE DYEING BEHAVIOR OF VAT DYES

Temperature manipulation affords a powerful means of modifying the dyeing behavior of vat dyes. High temperature increases the rate of exhaust and thus tends to decrease levelness, but high temperature also increases the rate of diffusion and thus acts to increase levelness. Low temperature decreases the rate of exhaust and thus promotes levelness. In view of these facts, level dyeing may be greatly assisted by commencing dyeing at a low temperature to get the benefit of a slow exhaust rate and then gradually raising the temperature to secure maximum color yield and at the same time the levelling and penetrating benefits of a high diffusion rate.

The judicious use of levelling assistants may also be of value in producing level dyeings with recalcitrant colors. However, their use should be kept to a minimum for they produce their effect by retaining dye in the bath. Therefore, to the cost of the assistant must be added the additional cost of the extra dye required to attain the same shade that would be secured in their absence. Other means of levelling such as temperature manipulation or mechanical assistance may be more economical.

Figures 11, 12 and 13, illustrate the effect of temperature manipulation and of levelling assistants on the rate of exhaust.

Figure 11 shows exhaust curves at 80°F. and at 130°F., with and without the addition of sodium lignin sulfonate to the dyebath.

At 80°F. the assistant exerts no effect and the sole effect is due to temperature.

At 130°F. the assistant holds about 5% more of the dye in the bath than remains in its absence.

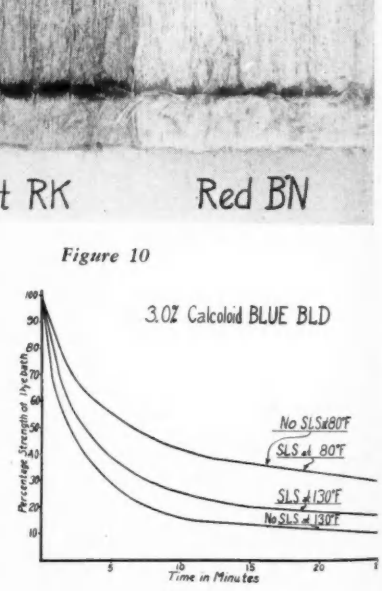


Figure 11

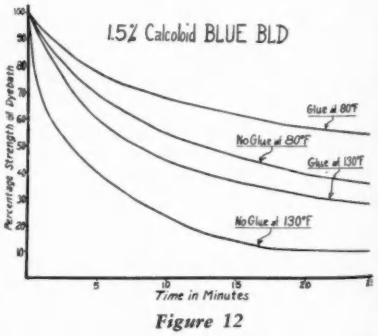


Figure 12

Figure 12, shows exhaust curves at 80°F. and at 130°F., with and without the addition of glue to the dyebath.

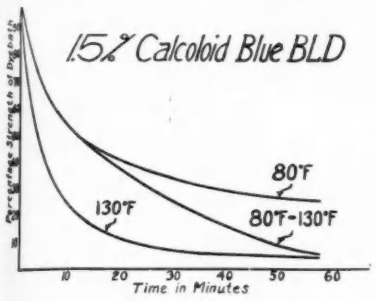


Figure 13

At 80°F. the glue holds about 20% more of the dye in the bath than remains in its absence.

At 130°F. the glue again holds about 20% more of the dye in the bath than remains in its absence.

Two methods of influencing the levelness of a Blue BLD dyeing are thus evident. In the first method, the dyeing may be made without an assistant, starting at 80°F., running about 15 minutes, and then slowly raising the temperature to 130°F., in order to secure full color yield. This method depends on temperature manipulation alone to produce a level dyeing. This is illustrated by figure 13.

In the second method the same procedure is followed except that glue is present in the dyebath. In this method besides the levelling effect produced by temperature manipulation, about 30% of the dye remains in the bath and can reach any lightly dyed fiber and bring it up to shade. This method will sacrifice some color value.

Figures 14 to 23 inclusive, show the levelling effect of certain agents on a few dyes when used at a temperature of 70°F., and when used at a temperature of 140°F. The mounted dyeings represent 5 successive skeins, each dyed for 30 seconds. The graduation of shade from skein No. 1 to skein No. 5 shows the levelling influence of the agent. Comparison of any one set of 5 skeins with another set, indicates the effect of the agent on the color yield.

3. EFFECT OF TEMPERATURE ON REDUCTION RATES OF VAT DYES

The color cards issued by dye manufacturers usually state that vat dyes should be reduced for 20 minutes at the recommended temperature in order to secure full color yield. This data was originally based on the use of relatively coarse and hard-to-wet-out 100% powders. Modern colloidal pastes and dispersed colloidal powders usually require less time for complete reduction at the usual temperatures. Recently publicized methods of applying vat dyes, demand reduction of the dye in a very brief time which may be as short as few seconds at temperatures of 200°F. or higher.

Figures 24 to 26 inclusive, show the comparative rates of reduction of a few dyes at normal temperatures and at high temperatures.

Figure 27 gives the reduction times in seconds at 200°F. for some Calco vat dyes.

Figures 28 to 30 inclusive, show the comparative color yields and fastness to A.A.T.C.C. wash test No. 4 of some vat dyes when pigment padded and then reduced at temperatures of 120°F., 180°F., and 212°F.

4. STRIPPING VAT DYEINGS

The action of various agents is usually quite specific with respect to individual dyes, and when their use is indicated, a judicious selection based on first hand information should be made in conformance with the action desired, the

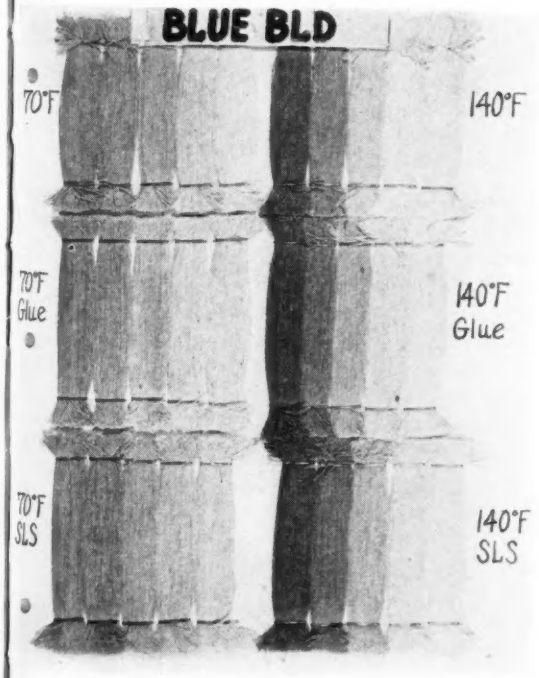


Figure 14

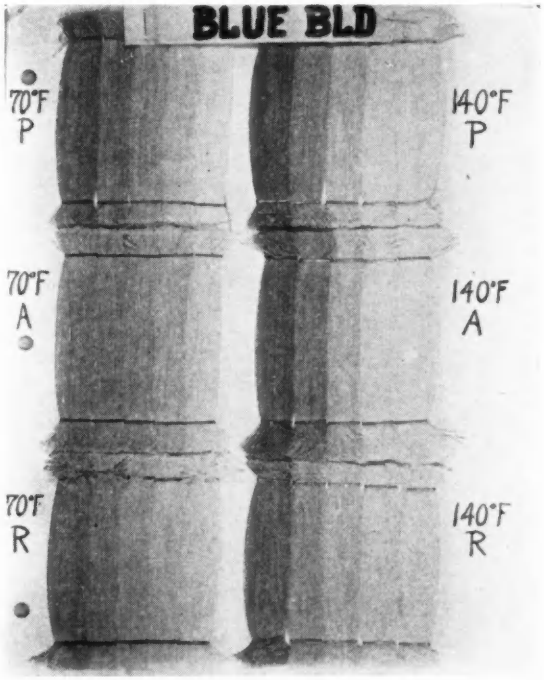


Figure 15

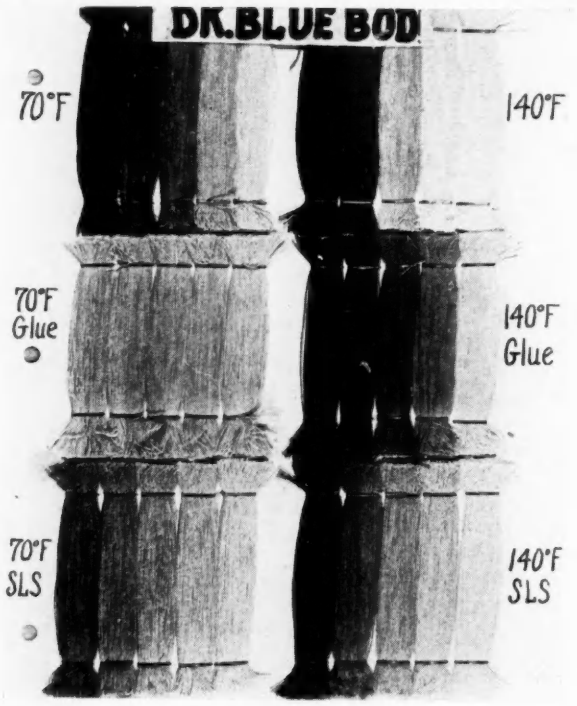


Figure 16

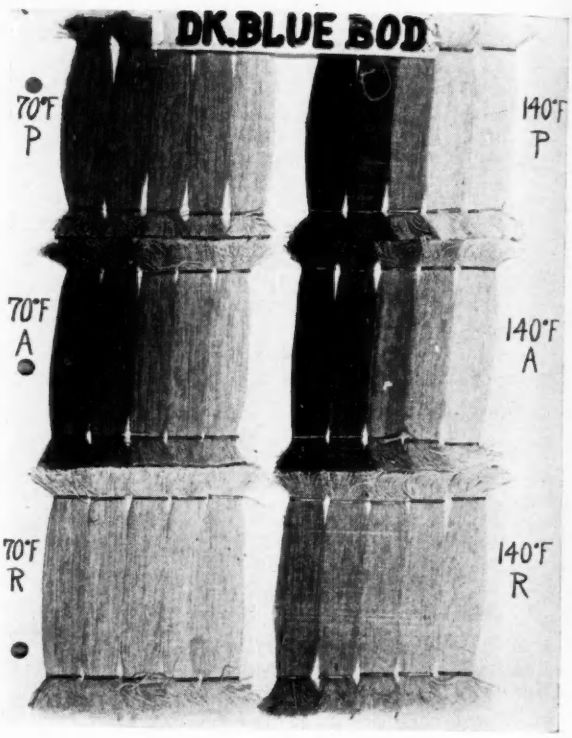
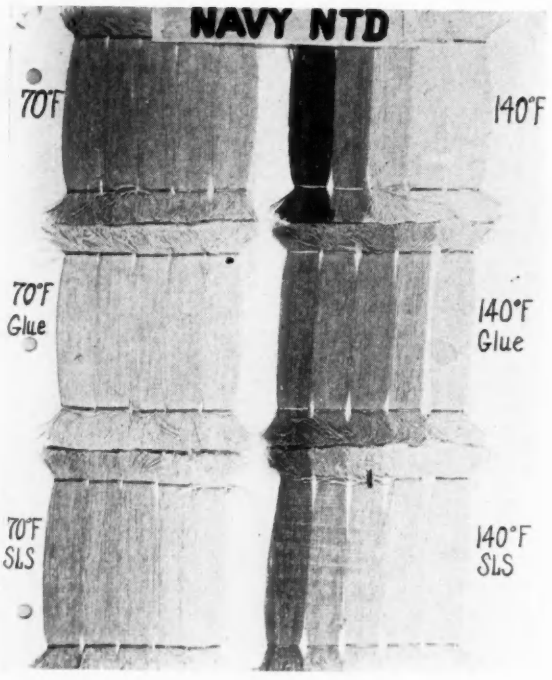


Figure 17



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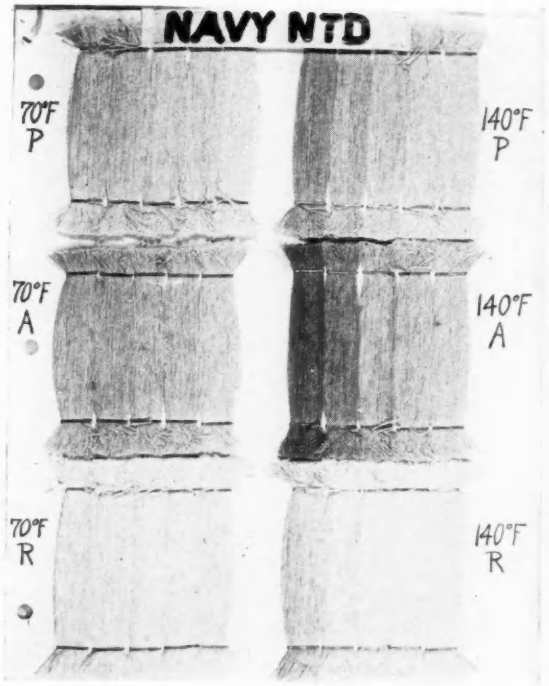

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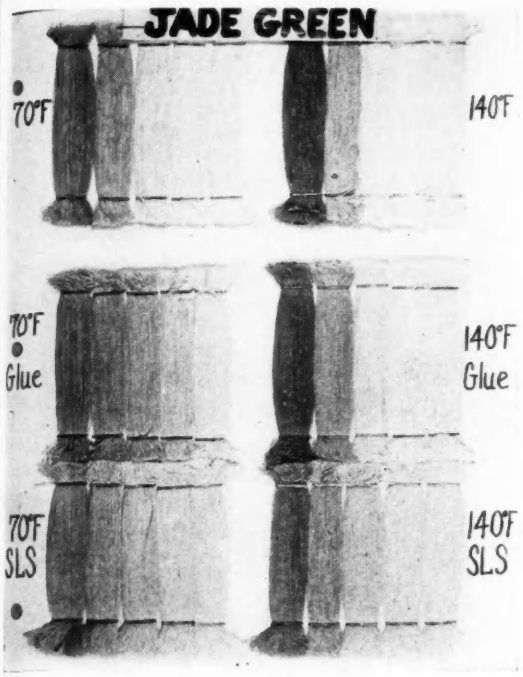


Figure 20

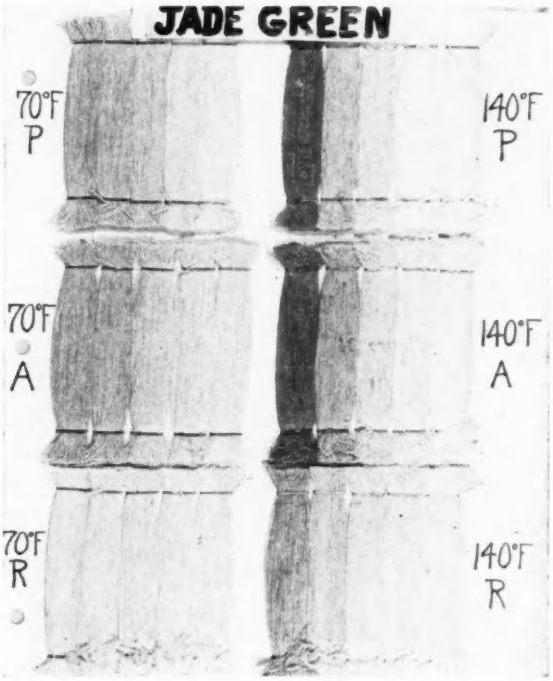
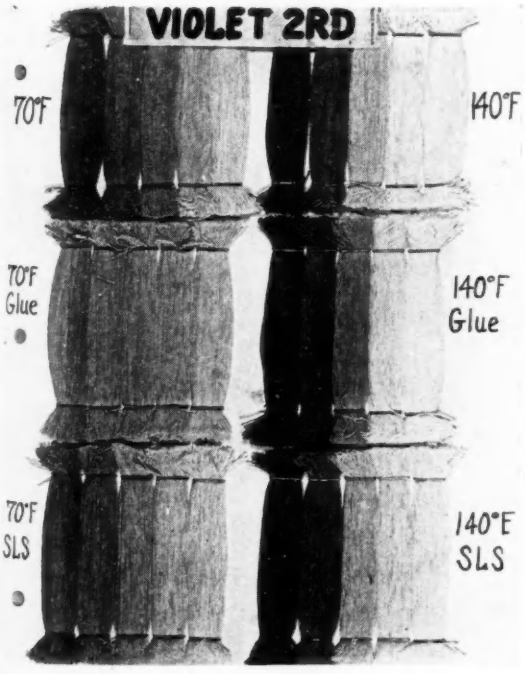


Figure 21



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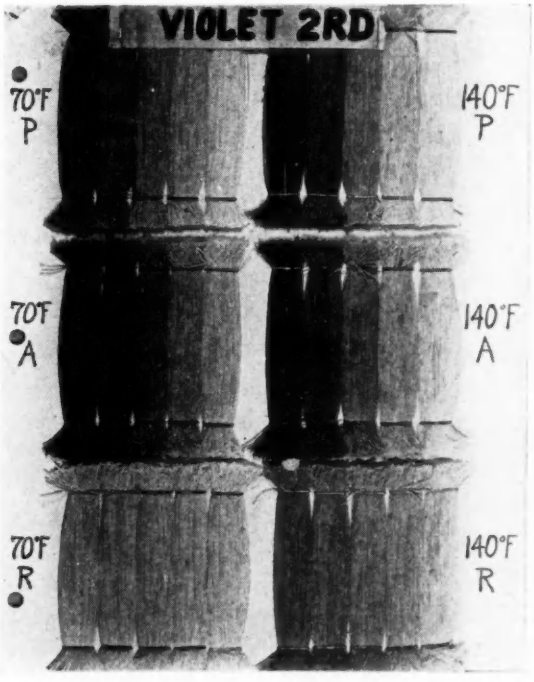

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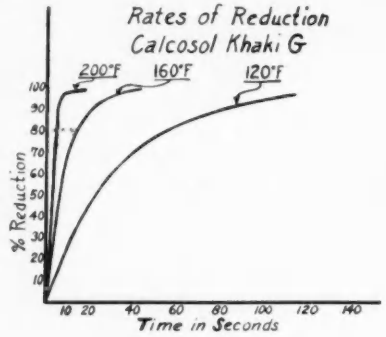

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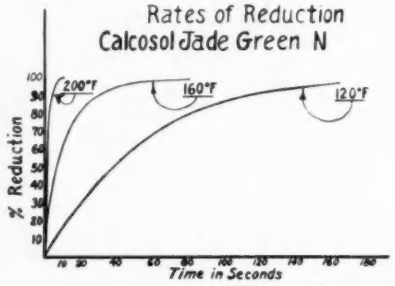

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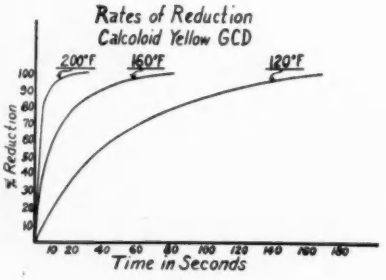


Figure 26

Reduction Time at 200°F.

Calcoloid Blue BLD	7 sec.
Calcoloid Navy Blue NTD	6 sec.
Calcoloid Brown G	5 sec.
Calcoloid Golden Orange GD	25 sec.
Calcoloid Violet RRD	8 sec.
Calcoloid Yellow GCD	20 sec.
Calcosol Grey 2G	6 sec.
Calcosol Brown BR	6 sec.
Calcosol Olive Green BN	6 sec.
Calcosol Red BN	7 sec.
Calcosol Violet BN Extra	5 sec.

Figure 27

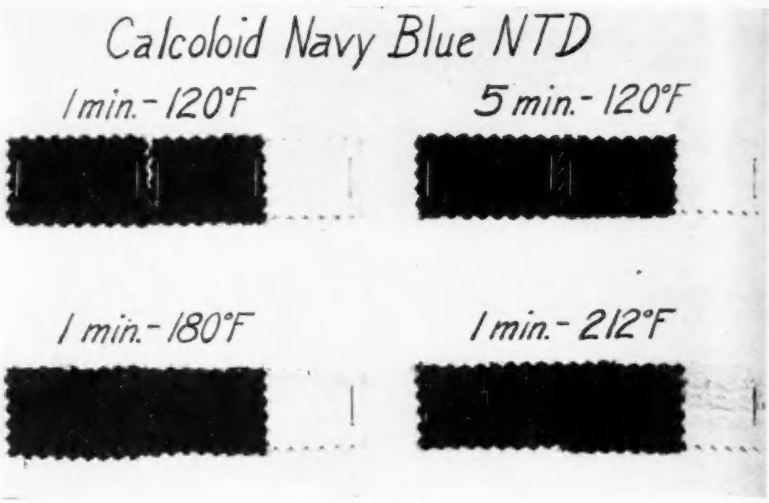
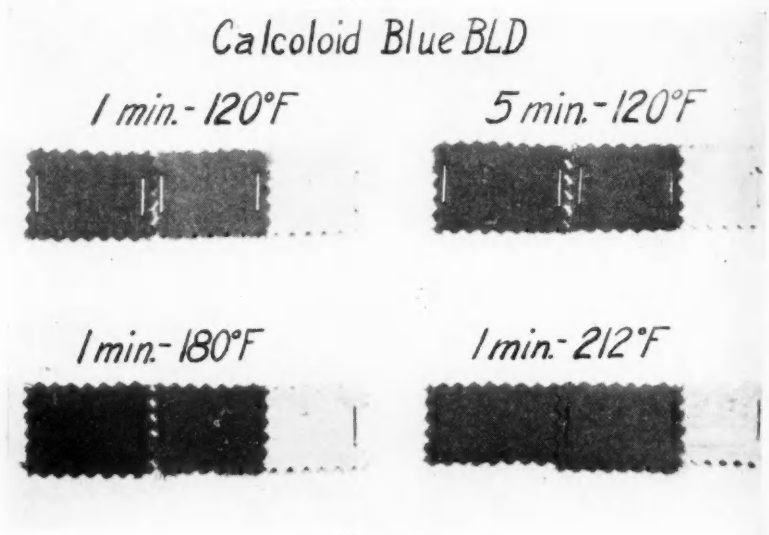


Figure 28



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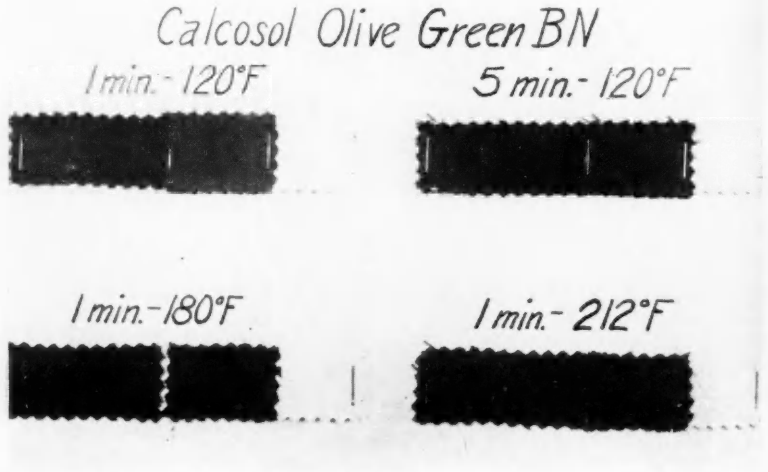

Figure 30

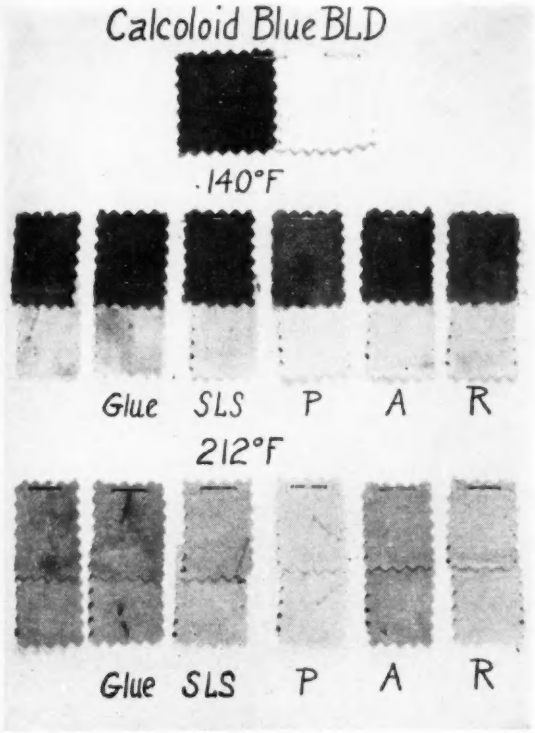

Figure 31

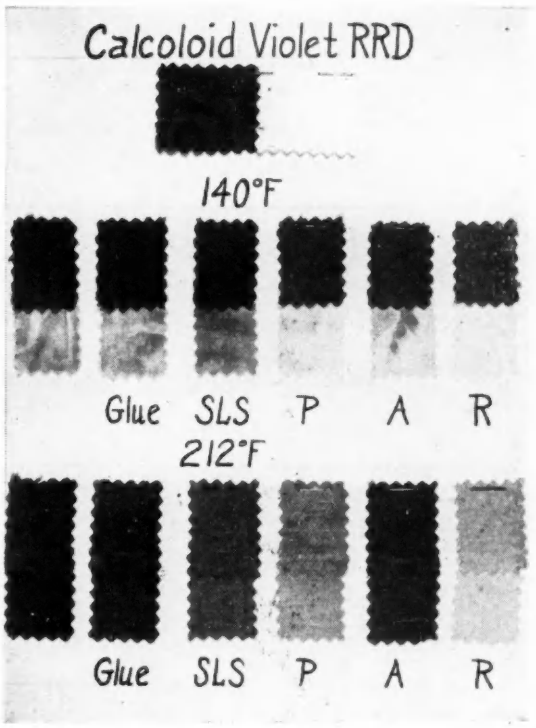

Figure 32

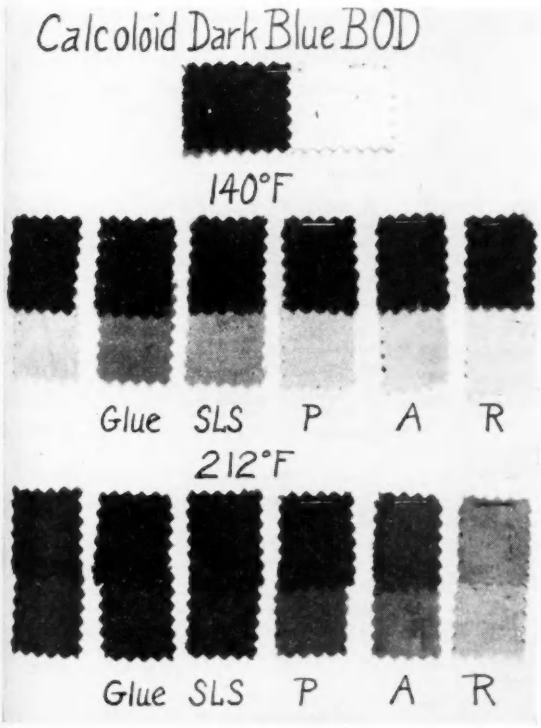

Figure 33

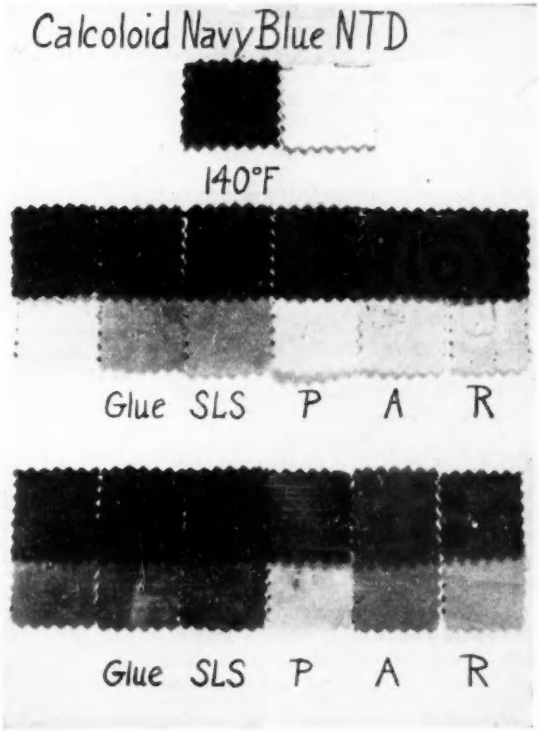

Figure 34

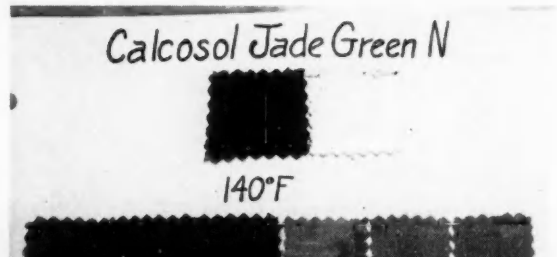

Figure 35

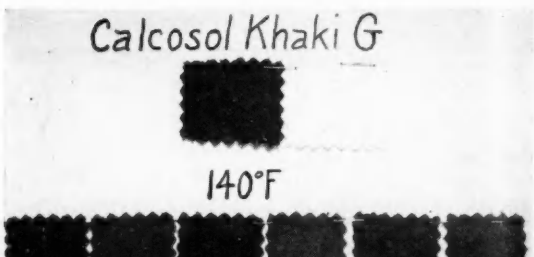

Figure 36

temperature to be employed and other pertinent factors.

When used for stripping, some agents must be thoroughly rinsed out together with the stripped dye, before redyeing can proceed. The effect of other agents can be neutralized at a desired stage of the process and the stripped dye fed back on to the fiber.

Figures 31 to 36 show the comparative stripping effect of certain agents on a few vat dyes at two different temperatures, 140°F., and 212°F. Five per cent shades of each dye were attached to an equal weight of undyed cloth and the resultant sample was immersed in a caustic-hydro bath containing the specified assistant and stripped for 30 minutes at the designated temperature.

The most noticeable observation is that very little stripping and levelling occurred at a temperature of 140°F. with any of the assistants.

The second observation is that many dyes level well at 212°F. in a caustic-hydro bath without the use of assistant. This statement should be qualified with the remark that a large ratio of fiber to bath, continuous immersion and good agitation assist this action, and that these three factors are often absent under practical mill conditions.

The third observation is that some assistants really exert a stripping rather than a levelling effect, for most of the dye which strips off of the dyed cloth remains in the dyebath.

5. THE EFFECT OF VARIOUS PROCEDURES ON THE VAT DYEING OF CALCOLOID BLUE BLD ON PACKAGES

On display are a series of packages which have been dyed with Calcoloid Blue BLD under different procedures. The packages have been sliced in half and the distribution of dye throughout the package is clearly shown.

6. CONCLUSION

The data and slides which have been discussed in this paper indicate the type of information which must be supplied to the textile dyers and chemists if they are to function most effectively in this post war period.

Acknowledgement is hereby expressed to the staffs of the Research and Application Laboratories for their cooperation and special recognition is due to the value of the data provided by "Dyeometer" studies.

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MEETING, SOUTHEASTERN SECTION

THE Southeastern Section held its annual meeting at the Atlanta Athletic Club in Atlanta, Ga., on Saturday evening, December 15, 1945, beginning with dinner being served at 7:00 P.M.

Vice Chairman J. E. Smenner presided in the absence of Chairman O. G. Edwards, due to illness.

C. A. Jones of Georgia Tech and past chairman of our section introduced members of his student chapter of A.A.T.C.C. and outlined their plans.

L. E. Whittelsey, Program Chairman, introduced the following speakers:

Speaker: Herman A. Dickert, Director, Textile Dept., Georgia School of Technology, Atlanta, Ga.

Subject: "Plans for Georgia Tech Textile School."

Speaker: J. A. Truitt, Director of Educational Branch of Textile Research Dept., American Viscose Corp., Marcus Hook, Pa.

Subject: "Rayon From War to Peace."
Speaker: James R. Chapman, Engineer, Girdler Corp., Thermex Div., Louisville, Ky. Assisted by Willard Hickok.

Subject: "Electronics in Textile Mills."

The speakers answered questions by the audience, which displayed much interest in the above subjects.

The following officers for 1946 were elected:

Chairman: A. Kempton Haynes, Rohm & Haas Co., Inc., Atlanta, Ga.

Vice Chairman: M. T. Barnhill, Avondale Mills, Sylacauga, Ala.

Secretary: Dr. H. M. Waddle, West Point Mfg. Co., West Point, Ga.

Treasurer: Allyn J. Morse, North Georgia Processing Co., Toccoa, Ga.

Councilor: W. B. Griffin, Kali Mfg. Co., Atlanta, Ga.

Sectional Committee: R. O. Simmons, Pepperell Mills, Lindale, Ga.; H. L. Dozier, Adelaide Mills, Anniston, Ala.; J. C. Farrow, Jr., Russell Mfg. Co., Alexander City, Ala.; N. P. Arnold, Electro-Chemicals Div., DuPont Co., Atlanta, Ga.

Attendance: 74 members and guests.

Respectfully submitted,
W. B. GRIFFIN, *Secretary*

A PRACTICAL LABORATORY TEST FOR EVALUATING SCOURING AGENTS FOR COTTON*

O. C. BACON

Technical Laboratory, E. I. du Pont de Nemours & Co., Inc.

At the present time, there is no generally accepted laboratory procedure for evaluating scouring agents for cotton. A standard test for evaluating detergents is of interest to the detergent manufacturer and to the large consumer of detergents. The following test procedure should serve as the basis for a standard cotton scouring test for the evaluation of detergents.

The principal obstacle now confronting the adoption of a standard cotton scouring test procedure is the difficulty of preparing a standard soiled material. Cotton fabric soiled with a mixture of some form of carbon, usually lamp black, a mineral oil and a vegetable oil or animal fat tends to become much more difficult to scour on ageing. These materials have formed the basis of most artificial soils since they predominate in natural soils. In general, these types of materials may be considered satisfactory for use in laboratory scouring tests.

The use of a Launder-Ometer as a scouring machine is considered satisfactory for a laboratory test. A speed of 60 RPM instead of the customary 42 RPM is preferred. The Launder-Ometer may not give perfect duplication of mechanical action. However, checks are close enough to warrant its use to obtain a large number of test results in a short time.

Cotton sheeting, having the following specifications, is satisfactory for preparing the soiled material:

1. The sheeting shall be thoroughly scoured and bleached to a whiteness of approximately 75 per cent that of magnesium oxide.
2. The sheeting shall have a weight of 2.85 yards per pound and a warp and filling count of 48 x 48 threads per inch at 40 inches gray width.

Other fabrics tried were either less uniform after soiling or scoured less uniformly in the Launder-Ometer due to creasing in the jars. Other fabrics tested include jean cloth, muslin, jungle cloth, broadcloth, twill and sateen.

A satisfactory standard dirty material must not change appreciably with age, at least for several months. The dirty material used in the present test will not keep much more than a week when stored in the laboratory exposed to the atmosphere, especially in damp weather. However, we have found that storage in a desiccator containing calcium chloride permits keeping our standard dirty material for at least three months without change in scouring results. These tests are still in progress. Storage in a covered pail, containing a beaker of calcium chloride and opened several times a day during use, has proven satisfactory for one month in winter. More careful storage may be required in the humid, summer months. Moisture also affects the soiled material at the time of preparation. Dirty material should be prepared on days when the relative humidity is below 50%. Material prepared on rainy or humid days will not give a significant spread in brightness when scoured. The use of hard rubber rolls, during the padding application of soil, also decreases scourability considerably. Hard rubber rolls cause the soil to penetrate the fabric more than soft rubber rolls. This effect is not noticeable in the case of soils difficult to remove because of humidity effects during storage.

Dirty material prepared as described later should have an initial brightness of 20 per cent to 25 per cent relative to MgO. The initial brightness should be increased from 20 per cent or 25 per cent to about 30 per cent or 35 per cent by rinsing 20 minutes in distilled water at 120° F. in the Launder-Ometer. The brightness after rinsing followed by scouring under the same conditions, with an optimum concentration of detergent solution in place of the distilled water, should be a maximum of 45 for a fair detergent. 50 for a good detergent and 60 for an excellent detergent. The above interpretation of detergent efficiency is based on the maximum brightness obtainable under the conditions specified over a range of detergent concentrations. The concentration required to give maximum brightness is also a factor. A detergent giving maximum brightness at 0.1 per cent is, of course, more efficient than one requiring 0.2 per cent to give the same brightness. However, from an economic point of view, if the former costs twice as much as the latter, their cost in terms of performance would be equal. We must also bear in mind that the test is an arbitrary one with regard to the type of soil involved.

The following is a detailed description of the test procedure in its present state of development:

APPARATUS AND REAGENTS

1. One wringer equipped with two soft rubber rolls and a pad box.
2. One Launder-Ometer operating at 60 r.p.m. and jars.
3. Stainless steel balls, one-quarter inch in diameter.
4. Prepared cotton sheeting dirty material.
5. Stock hard water solution, 6.0 g. $CaCl_2$ plus 3.7 g. $MgCl_2.6H_2O$ per liter.
6. One Photometer, Lange Universal Photoelectric.
7. Special box for drying dirty material (optional).
8. One oven operating at 170° F.

PREPARATION OF DIRTY MATERIAL

Bleached, unfinished 40 inch, 48 x 48, 2.85 cotton sheeting, as prepared for vat pigment—pad dyeing, shall be used as the material for soiling.

The soiling composition shall consist of:

60.0 grams Germantown Lamp Black
180.0 grams Crisco
258.0 grams Nujol
120.0 grams Wheat starch (200 mesh)

This soiling composition is essentially the same as given in The Bureau of Ships Ad Interim Specification, 51S47 (INT) dated April 1, 1944, entitled "Soap, Salt-Water, Powdered (For Use in Soft, Hard, or Sea Water)."

Mix the wheat starch (screened through a 200 mesh sieve) lamp black, and Crisco at 100° F. using a glass beaker and stirring rod. Add the Nujol and continue mixing at 100° F. until homogeneous.

Apply the soiling composition to the cotton fabric by immersion padding. Dilute 10.3 g. of the soiling composition to 1000 ml. with carbon tetrachloride for use in the padding machine. Pass the fabric through the pad box and squeeze rolls. The pad box should contain sufficient liquor to cover the immersion roll to a depth of 2 to 4 inches during the padding operation. Dry the impregnated fabric in the air, then repeat the padding and drying operation. Reverse the fabric end for end and top to bottom during the second

* Presented at the Cotton and Manufactured Organic Fiber Group of the A.A.T.C.C. Detergency Committee meeting at Charlotte, N. C., June 9, 1945.

padding. Heat the prepared fabric for 30 minutes at 160° F. The brightness should be 20 per cent to 25 per cent relative to magnesium oxide. Use the dirty material within one week after preparation unless it is stored in a desiccator containing $CaCl_2$. The soiled material should be kept 24 hours under the conditions of storage before use to establish a uniform moisture content. Instead of drying the impregnated fabric in the air, a drying box, as described in the Hercules Powder Company Bulletin entitled "Rosin—Its Place in Soap," copyrighted 1942, may be used. This box serves to dry the impregnated fabric at elevated temperatures and to eliminate the solvent fumes. The box is 6 feet long, 5 feet high, and 14 inches wide. It is heated by an electric coil and exhausted by means of a high-speed electric fan in the vent pipe. The fabric moves through the box over and under rollers placed along the top and bottom. The length of fabric in the box during use is seven yards.

Place 20 one-quarter inch stainless steel balls and two pieces of the dirty material 3" x 3" in each jar with 200 ml. of distilled water. Place the closed jars in the Launder-Ometer and heat the water bath to 124° F., (120° F. if machine has a temperature control) at the same time slowly rotating the jars by hand. When the bath reaches the desired temperature, start the machine and run for 20 minutes. Remove the jars and take the pieces from the jars by hand without squeezing. Retain two pieces from one jar as the "blank" to be dried and evaluate for reflectance. Place the remaining pieces in a beaker of distilled water.

SCOURING OPERATION

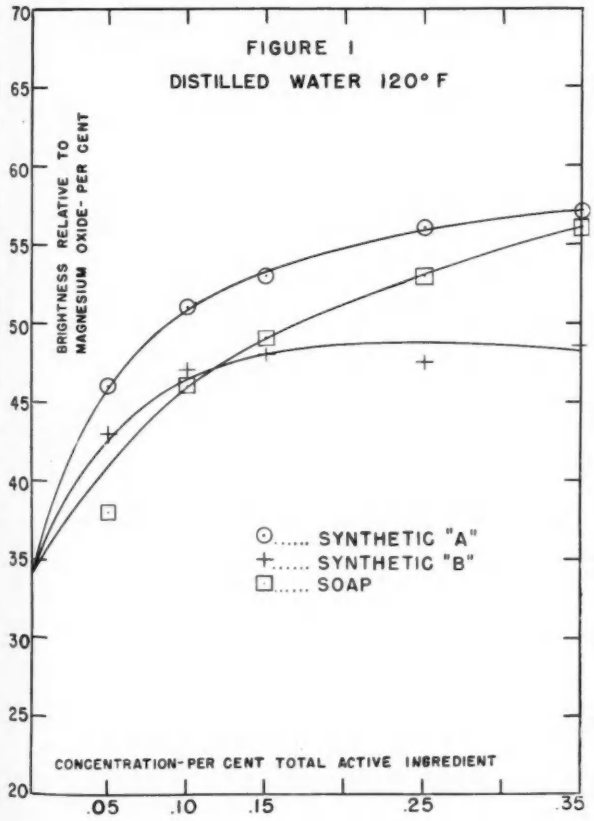
Remove the rinsed, dirty material from the beaker of distilled water, drain without squeezing, and place two pieces of the rinsed material in each of another set of Launder-Ometer jars containing solutions of the detergents to be tested.

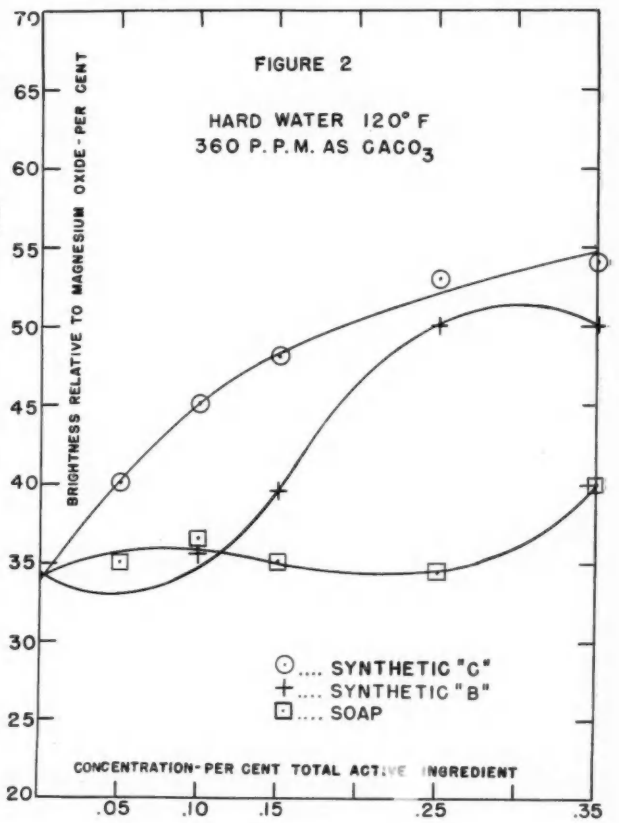
For comparison on an active ingredient basis, prepare stock solutions of 2.4 g. of active ingredient in 600 ml. of distilled water. Use aliquots of 10, 20, 40, 75 and 125 ml. to obtain active ingredient concentrations of 0.02%, 0.04%, 0.08%, 0.15% and 0.25%. For a soft water test, dilute these aliquots to a total volume of 200 ml., and for hard water to a total volume of 190 ml., and add 10 ml. of stock hard water solution.

Place the closed jars for the detergency test in the Launder-Ometer and heat the water bath to 124° F. or 120° F. as before. Start the machine and run for 20 minutes. Then remove the jars, take the pieces from the jars, rinse in water of the type used in scouring at 120° F. by holding the test piece by one corner and dipping three times. Repeat this operation in the same type of water at room temperature. Place the rinsed pieces on paper towels with identification marks and allow them to almost dry in the air. Iron the samples dry between clean white cloths.

After the pieces are dry, determine the per cent brightness using the reflectometer calibrated to read relative to magnesium oxide. In determining the brightness values, make certain that the pieces lie flat, and use one piece of dirty material as a background under the other. Record the average per cent brightness value for each piece separately, reading each piece at four locations. Average the per cent brightness for each set of pieces and plot the brightness obtained as the ordinate value against the corresponding concentration value as the abscissa. The per cent brightness of the pieces rinsed in distilled water for 20 minutes at 120° F. shall be taken as the value corresponding to zero concentration of detergent.

Typical results o tained with the above procedure are illustrated by curves in Figures 1 and 2. The curves are obtained by plotting the concentration of detergent,





active ingredient, and the brightness relative to magnesium oxide as abscissa and ordinates respectively. Figure 1 shows curves for two synthetic detergents and soap run in soft water at 120° F. for 20 minutes. Figure 2 shows two synthetic detergents and soap run in hard water containing the equivalent of 360 p.p.m. $CaCO_3$ at 120° F. for 20 minutes. Synthetic A is a very good soft water detergent even at low concentrations. Soap is a good detergent at the higher concentrations in soft water but is poor in hard water unless sufficient is used to soften the water. Synthetic B is only a fairly good detergent in soft water and is poor in hard water at low concentrations but is better in hard water than in soft water at higher concentrations. Synthetic C is a good hard water detergent. These results correlate with the known practical performance of the detergents tested. A further indication that the test parallels practical detergency is shown in Figure 3. The curves in Figure 3 show that increasing the temperature of scouring increases the efficiency of a detergent which performs better at higher temperatures.

The accuracy of the test should be examined with regard to three factors which are as follows:

1. Duplication of dirty material
2. Reproducibility in the Launder-Ometer
3. The effect of age on the dirty material

With ordinary care and good equipment, we have obtained excellent reproduction of dirty material. The variation obtained on impregnating three 60-yard pieces of cotton is practically within the error of making reflectometer readings. Single reflectometer readings every 10 feet from two such runs, totaling 360 yards, are given in Table I.

The uniformity of rinse values has been checked and found to vary from 32 to 36 with an average of 34 for 23 runs over a period of 1 month. A rinse value should be determined in each load as a check and for use in reducing curves to a common origin if desired. Preliminary work indicates that two curves having rinse values of 31% and 34% may be corrected by adding or subtracting 3% all along the proper curve.

The most desirable procedure would be to correct all curves to an arbitrary standard rinse value, say 34%. Such a procedure is equivalent to calculating the "spreads" for curves starting at different rinse values.

The stability of ageing of a dirty material is very important. The following tests were made in order to check the ageing characteristics of the dirty material prepared as described above. The results show that stability for at least 12 weeks is obtained by:

1. Impregnating the fabric and drying in the air on a dry day.
2. Baking 30 minutes at 170° F., and
3. Storing in a desiccator with calcium chloride.

Only the above soiling mixture has been evaluated in extensive tests. Preliminary tests indicate that a radical change in the soiling mix would be required to obtain a more stable dirty material.

Preliminary tests have indicated that baking for 1 hour at 170° F. "fixes" the soil and prevents sufficient scouring to obtain a satisfactory spread after 10 days in the desiccator. The critical humidity during storage has not been determined. Tests are under way to determine, if

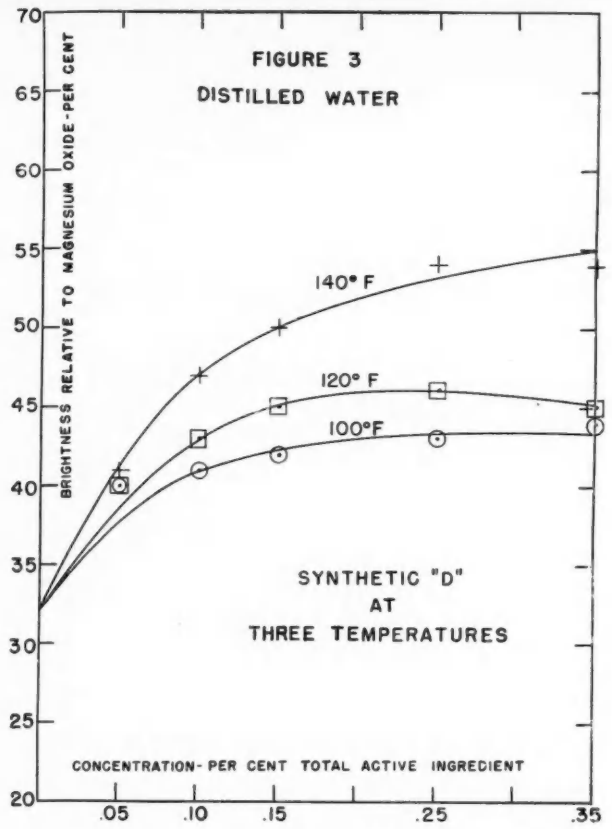
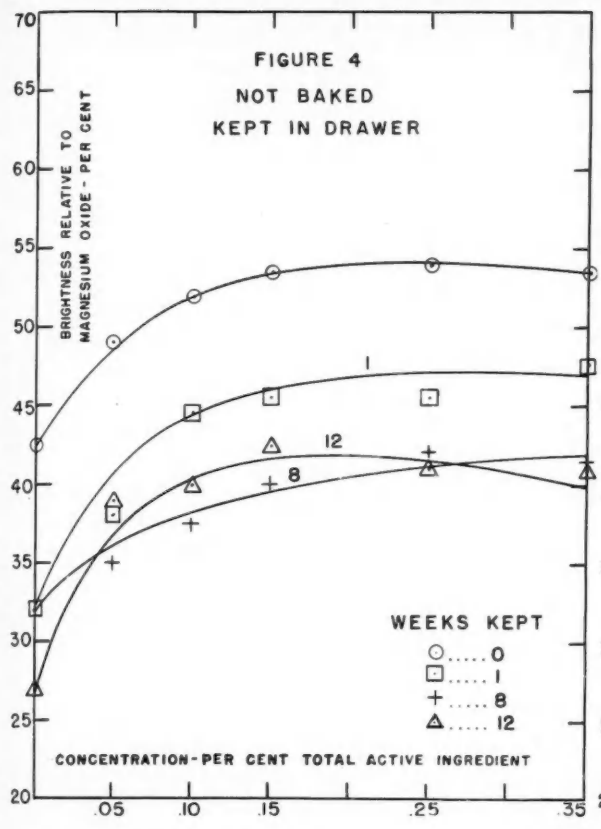
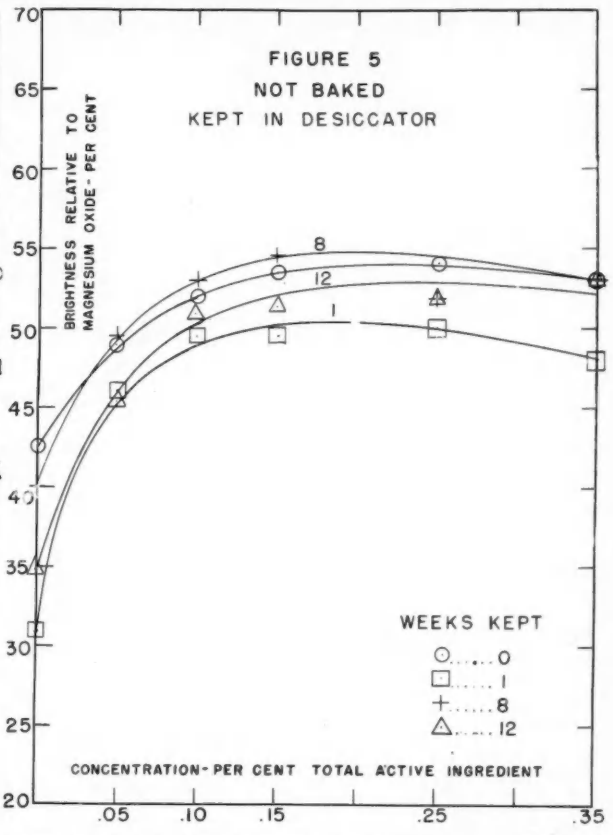


TABLE I
Uniformity of Impregnation

	Reflectomer Readings at 10 Foot Intervals					
	Material Made March 9 *60 Yard Strips*			*Material Made April 26* *60 Yard Strips*		
	No. 1	*No. 2*	*No. 3*	*No. 1*	*No. 2*	*No. 3*
	21	20	21	21	23	22
	20	18	20	23	22	22
	22	19	21	21	21	21
	21	20	20	21	20	21
	20	21	20	22	21	21
	21	21	21	21	22	23
	20	20	21	20	21	22
	20	20	21	23	22	22
	21	19	20	21	22	21
	21	20	21	23	23	20
	20	21	21	22	21	21
	23	20	20	22	22	22
	22	19	20	22	22	21
	21	19	20	22	23	23
	22	20	20	23	23	23
	21	20	21	23	24	23
	21	21	20	24	23	24
Total	357	338	348	374	375	372
Average	21	20	20	22	22	22





possible, why humidity is an important factor in both the preparation and storage of dirty material. Applications from an aqueous medium and other solvents will be studied among other factors.

Table II summarizes the variations in preparation of dirty material which have been studied over a 12 week's period.

TABLE II

1. Stored in a Drawer
   - A. Not baked
   - B. Baked 15 minutes at 170° F.
   - C. Baked 30 minutes at 170° F.
2. Stored in a Desiccator
   - A. Not baked
   - B. Baked 15 minutes at 170° F.
   - C. Baked 30 minutes at 170° F.

The above variations were studied on a single piece of fabric impregnated and air dried in a uniform manner. Scouring results were obtained by the procedure already outlined. The reflectance data obtained are given in Table III. For a fabric treatment to be satisfactory, it is desirable that:

1. The variation in the pre-rinse reflectance values obtained over the period of 12 weeks should be as small as possible. This is also true of the reflectance values obtained by scouring with an arbitrary concentration of detergent. See the last column of Table III under the heading "Maximum Variation."

TABLE III

Effect of Ageing on Reflectance Values Obtained by Scouring in Soft Water with no Detergent and by Scouring in 0.25% Detergent (100% AI)

Fabric Treatment			% Reflectance Relative MgO Number of Weeks Stored							
Baked 170° F. Min.	Storage Conditions	Detergent %	0	1	2	4	8	12	Average	Maximum Variation
0	Drawer	0.25	54	47	46	42	41	42	45 ± 4	13
0	Drawer	0	42	31	33	32	29	27	32 ± 3	15
	Spread		12	16	13	10	12	15	13	—
15	Drawer	0.25	54	44	44	40	45	35	44 ± 4	19
15	Drawer	0	36	32	34	31	27	27	31 ± 3	9
	Spread		18	12	10	9	18	8	13	—
30	Drawer	0.25	50	45	45	41	37	35	42 ± 4	15
30	Drawer	0	36	33	31	33	30	26	31 ± 3	10
	Spread		14	12	14	8	7	9	11	—
0	Desiccator	0.25	54	51	46	45	53	52	50 ± 3	9
0	Desiccator	0	42	36	36	36	39	36	37 ± 2	6
	Spread		12	15	10	9	14	16	13	—
15	Desiccator	0.25	54	47	49	49	44	46	50 ± 1	10
15	Desiccator	0	35	36	35	36	32	32	37 ± 1	4
	Spread		19	11	14	13	12	14	13	—
30	Desiccator	0.25	50	46	50	49	49	49	49 ± 1	4
30	Desiccator	0	37	37	34	35	35	34	35 ± 1	3
	Spread		13	9	16	14	14	15	14..	—

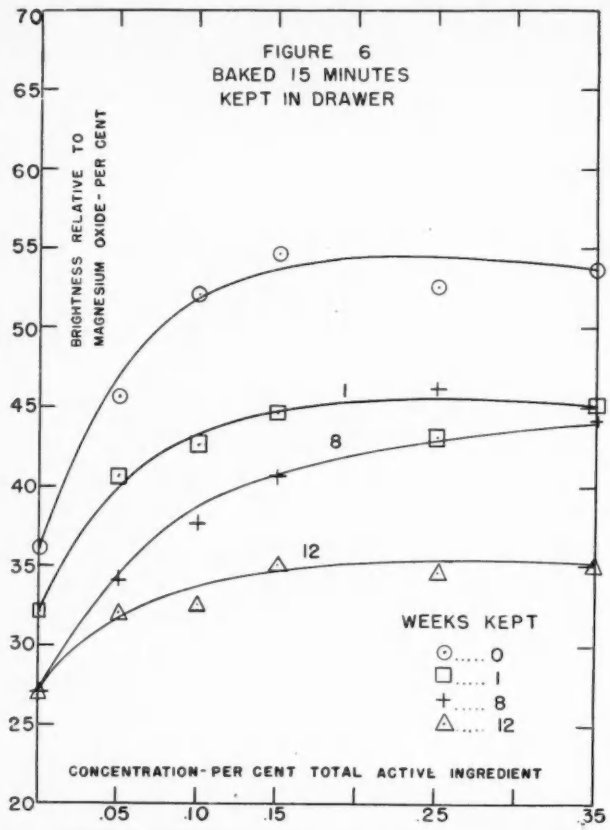


FIGURE 6
BAKED 15 MINUTES
KEPT IN DRAWER
BRIGHTNESS RELATIVE TO MAGNESIUM OXIDE - PER CENT
CONCENTRATION - PER CENT TOTAL ACTIVE INGREDIENT
WEEKS KEPT
0
1
8
12

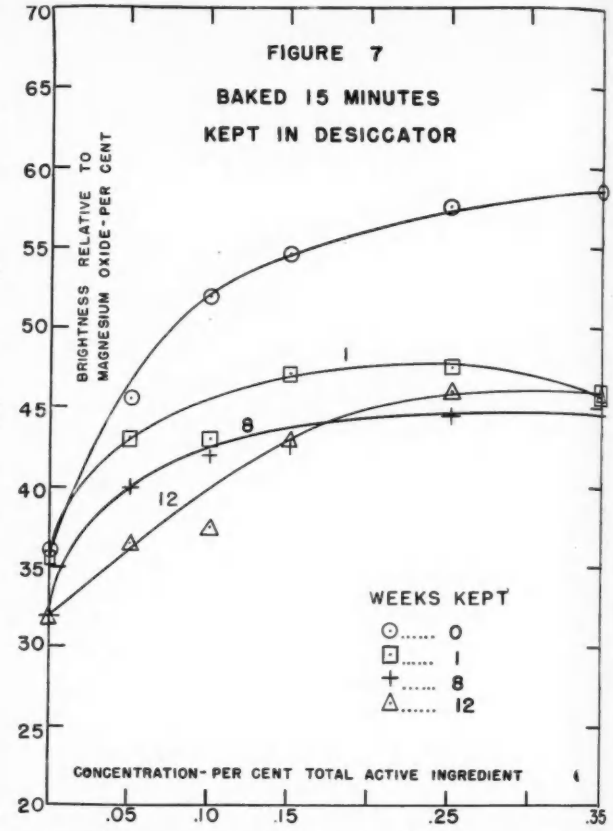


FIGURE 7
BAKED 15 MINUTES
KEPT IN DESICCATOR
BRIGHTNESS RELATIVE TO MAGNESIUM OXIDE - PER CENT
CONCENTRATION - PER CENT TOTAL ACTIVE INGREDIENT
WEEKS KEPT
0
1
8
12

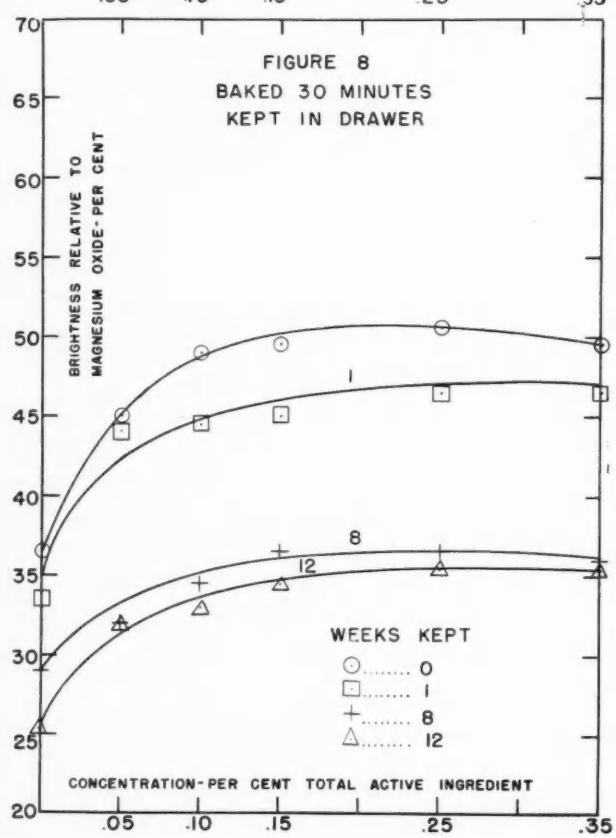


FIGURE 8
BAKED 30 MINUTES
KEPT IN DRAWER
BRIGHTNESS RELATIVE TO MAGNESIUM OXIDE - PER CENT
CONCENTRATION - PER CENT TOTAL ACTIVE INGREDIENT
WEEKS KEPT
0
1
8
12

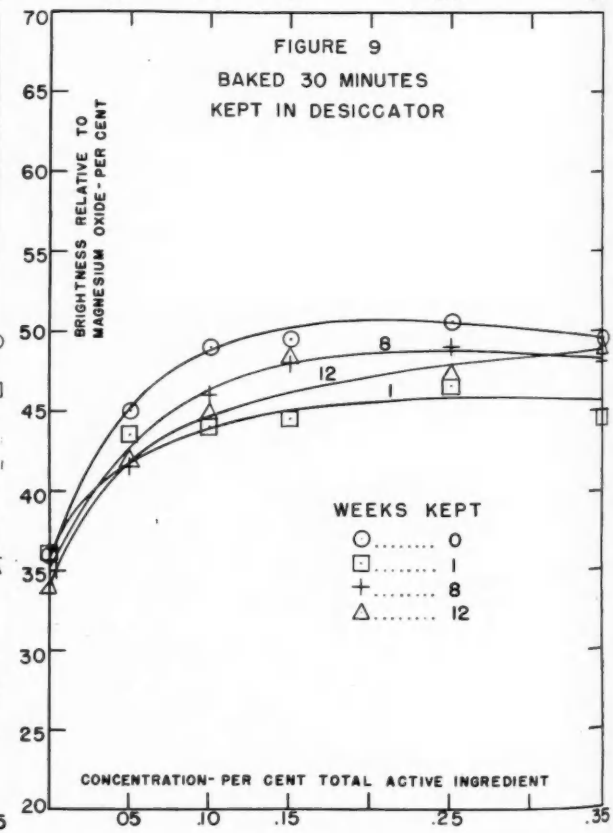


FIGURE 9
BAKED 30 MINUTES
KEPT IN DESICCATOR
BRIGHTNESS RELATIVE TO MAGNESIUM OXIDE - PER CENT
CONCENTRATION - PER CENT TOTAL ACTIVE INGREDIENT
WEEKS KEPT
0
1
8
12

2. The average spread between the reflectance after the pre-rinse and the reflectance after scouring should be a maximum. See "Average" in Table III.

The reflectance values given in Table III are figures obtained from tests on two test pieces of dirty material rinsed or scoured in the same Launder-Ometer jar. The figures are the average of four reflectometer readings made on both sides of each piece or a total of 16 readings. The rinsed values are subtracted from the scoured values to give the spread. The average rinse and scour values are given along with their mean deviation from average. These average values are also subtracted to give average spreads which agree with the averages of the actual spread within the accuracy of the average values which were calculated to the nearest unit value. The last column gives the maximum variation among the tests at the six selected intervals covering a period of 12 weeks.

A study of Table III, made with the above requirements in mind, shows that the six fabric treatments may be divided into five groups as are shown in Table IV.

TABLE IV

Suitability of Dirty Material According to Method of Treatment

Dirty Material 1 to 12 Weeks Old

Excellent—Baked 30 minutes, stored in desiccator
Good—Baked 15 minutes, stored in desiccator
Fair—Not baked, stored in desiccator
Poor—Baked 15 or 30 minutes and stored in a drawer
Bad—Not baked and stored in drawer

Figures 4, 5, 6, 7, 8 and 9 supplement Table III by graphically illustrating the reflectance data obtained over a range of detergent concentrations. The origin of each curve is the reflectance value of the dirty material after the rinsing operation and drying.

The results show that storage in a dry atmosphere is very important in keeping the dirty material. It may be possible to store fabric in a moisture proof envelope containing sufficient material for one or more days consumption. It may also be possible to prepare a dirty material that will keep in a drawer although it is generally recognized that many natural soils become more difficult to remove if left on a fabric too long.

—◆ ◆—

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Murray H. Roth—Research Chemist, Richards Chemical Works and Onyx Oil & Chemical Co., Jersey City, N. J. Sponsors: D. H. Patterson, C. D. Ehrengart.

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JUNIOR

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Harrison M. Gorton—Salesman, American Aniline Products, Inc., Providence, R. I.

Ernest Gruen—Raw Materials Engr., Western Electric Co., Inc., Kearny, N. J.

Veader Leonard—Research Experimental Therapeutics, Own Laboratory, Baltimore, Md.

Charles S. Lowe—Chemist, Swift & Co., Research Labs., Chicago, Ill.

Ronald G. Macdonald—Secretary, Treas., Technical Association of Pulp & Paper Industry, New York, N. Y.

Edwin E. Popcke — Research Director, Opinion Research Corp., Princeton, N. J.

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Hyman W. Zussman—Research Chemist, Alrose Chemical Co., Cranston, R. I.

Vernon Zweck—Director of Cotton & Rayon Fabrics Div., William Whitman Co., Inc., New York, N. Y.

• CALENDAR OF COMING EVENTS •

Victory Convention under auspices of New York Section, Hotel Pennsylvania, New York City, January 3rd, 4th and 5th, 1946.

Council Meeting, Hotel Pennsylvania, New York City, January 3, 1946.

Meetings of Sub-Committees of Research Committee, Hotel Pennsylvania, New York City, January 3, 1946.

President's Corporate Membership Dinner, Hotel Pennsylvania, New York City, January 3, 1946.

Research Committee Meeting, Hotel Pennsylvania, New York City, January 5, 1946.

Intersectional Contest, Hotel Pennsylvania, New York City, January 5, 1946.

Award of Olney Medal and Awards of Intersectional Contest Prizes, Annual Banquet, Hotel Pennsylvania, New York City, January 5, 1946.

Meeting, Philadelphia Section, January 18, 1946.

Meeting, Rhode Island Section, Providence Engineering Society Hall, 195 Angell Street, Providence, R. I., January 25, 1946.

Meeting, New York Section, Downtown Athletic Club, 19 West Street, New York City, February 15, 1946.

Meeting, Mid-West Section, Bismark Hotel, Chicago, Ill., February 16, 1946.

UNEMPLOYMENT REGISTER

Members of this association, who are without employment, should forward a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the American Dyestuff Reporter any vacancie which may occur in their business.

NOTICE TO EMPLOYERS

Personal Histories and Employment Records of the following applicants are on file at the office of the American Dyestuff Reporter. Prospective employers may examine them without obligation.

Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive.

A-2

Education—Graduate, Lowell Textile Institute, B.T.C., 1933.
Experience—Experienced as textile chemist, chemist-spotter, agricultural chemist and U. S. Army inspector on cotton, rayon, woolens and worsteds. Seeks research or control position with future. New England preferred.
Age 34; married; references.

A-3

Education—Ph.D. degree in chemistry, University of Lausanne, Switzerland. Knowledge of French, German and Russian.
Experience—Eleven years as assistant chemist and chemist in charge of laboratory with a large bleaching, dyeing, printing and finishing plant in New England. Experience in dyeing and printing cotton, rayons. Research. Five years with a textile testing laboratory of a mail order house in Midwest. Three years with an industrial research laboratory in vicinity of Boston.
Position desired in a laboratory in the East. References.

A-4

Education—B.T.C., Lowell Textile Institute, 1936.
Experience—One year as assistant to general manager in production of rubber coated textiles. Four years as assistant chemist working on the development and plant control of a number of rubber products including footwear, molded products, industrial rolls, tubing, etc. Seeks position as textile chemist or colorist or allied work.
Age 31, married; references.

A-B-1

Education—Bradford Durfee Textile School.
Experience—Eight years in dye laboratory testing dyes, matching shades, research work, trouble shooting combined with practical work on dyeing and bleaching. Two years as superintendent of dyeing, bleaching and drying. Had charge of laboratory and purchase of all materials for processing. Five years as dyer on cotton, rayon, silk and nylon. Seeks position as dyer, superintendent of dyeing and bleaching, or charge of dye laboratory.
Age 37, married, three children; references.

A-B-C-D-1

Education—High school graduate; Lowell Textile evening school (elementary chemistry, quantitative analysis, textile dyeing and chemistry).
Experience—2½ years as dry and wet-finish hand; 4 years as foreman of bleaching, dyeing and finishing on cotton piece goods; 2 years in army air forces, served as instructor.
Seeks position in chemical sales or technical service.
Age 28; married; references.

A-B-C-F-3

Education—High school and full apprenticeship.
Experience—Practical Dyer and finisher. Long experience on specialties for men's wear trouser trade in cottons, cotton and rayon mixtures and cotton and Celanese. Is disposing of interests in progressive finishing plant and seeks position as manager, assistant manager or technical advisor. Thoroughly understands requirements of Quartermaster, especially on herringbone construction.

A-D-1

Education—B.T.C., Lowell Textile Institute, 1922.
Experience—Three years as assistant chemist and chemist in bleachery. Twelve years as chemist with leather company, establishing laboratory, and handling purchasing of dyestuffs and chemicals. Seven years as sales engineer representing chemical company in New England for the textile and leather trades. Most recently associated with textile chemical company on sales and technical service of dyestuffs, soaps and chemical specialties. Seeks position as technical salesman.
Age 45; married, two children; references.

B-1

Education—2 years high school; 4 years dyeing, 2 years chemistry, Philadelphia Textile School.
Experience—16 years experience as a dyer in one concern. Experienced on auto cloth, wool, cotton, silk, rayon and mixtures of all kinds. Broad experience in field gained by experience in one large, wel-known mill qualifies this man, who is available for immediate employment as a dyer.
Age 37; married; 3 children; references.

B-C-1

Education—Lowell Textile Institute.
Experience—Many years of varied experience in charge of bleaching, dyeing, mercerizing, and finishing of cotton goods and rayon. Has a thorough knowledge of manufacturing, both technical and practical. Besides operation and processing, experience covers personnel management, supervision of building construction, machinery installation, production and costs. Seeks position as plant superintendent, technical engineer or consultant.
Age 65, married; references.

B-D-1

Education—Textile dyeing, college chemistry.
Experience—Over twenty-five years experience as dyer on various types of fibers and fabrics, dyestuff salesman, technical advisor on application of mildewproof and waterproof compounds and dyeing of casein fabrics. Seeks position as technical advisor and trouble shooter in viscose or protein fibers or as salesman of dyes or auxiliary compounds.
Age 47, married, four children; references.

B-D-3

Education—B.T.C., Lowell Textile Institute, 1939.
Experience—One year's experience as assistant dyer on wool felt hat bodies and raw stock, chemical control and research. Five years' experience as inspector of textiles for Q.M. depot, quality control and expediting in the finishing of cotton textiles. Seeks position as assistant superintendent, foreman, or in technical sales or research.
Age 28, married, three children; references.

C-1

Experience—Experienced as assistant finisher, finisher and superintendent of finishing since 1923. Experience on automobile cloth, boucle overcoatings, high grade men's wear worsted, low grade woolens, medium grade plaid-back overcoatings, fleece finish overcoatings. Bolivias, kerseys, medium-grade men's piece dye suitings, uniform cloth, flannels, ladies' dress goods and coatings, government serge and elastique fabrics, marine wool, flannel shirtings.
Age 37; married, 3 children; references.

TRADE NOTES • NEW PRODUCTS

From The Reporter Files

TEN YEARS AGO

Onyx Oil & Chemical Co. brought to a close its twenty-fifth year in business with a gala Silver Anniversary Banquet, held on December 28th at the Hotel Edison, New York City.

TWENTY YEARS AGO

The annual convention of the salesmen and representatives of Stein, Hall & Co., Inc., was held December 16 to 19 at the offices of the company.

It was formerly announced that, effective January 1, Kuttroff, Pickhardt & Co., Inc. would discontinue the importation and sale of dyestuffs. The General Dyestuff Corp. purchased the merchandising stock and would offer to the trade the dyestuffs which the former company supplied.

An advertisement for the 1925 Year Book reported that an up-to-date tabulation of American Dyes, classified alphabetically and by Schultz and Colour Index numbers was one of the features.

TWENTY-FIVE YEARS AGO

The December 27th issue of the REPORTER, wound up its seventh volume.

At a meeting of the Board of Directors of National Aniline & Chemical Co. J. W. Newlean was elected president. Orlando Weber was elected chairman of the board of directors of National and president of Allied Chemical & Dye Corp.

• PHILADELPHIA ALUMNI BANQUET

More than 300 graduates of the Philadelphia Textile Institute and others in the textile trades heard Dr. Harold DeWitt Smith, Treasurer of A. M. Tenney Associates, Inc., urge the broadening of basic education of textile leaders to provide a better preparation for intelligent world citizenship for enduring world peace, at a banquet of the Alumni Association of the Institute, held on December 14th at the Hotel Roosevelt, New York.

Dr. Smith reviewed briefly the development of textile school education in the United States, referring particularly to the improvements in quality and breadth of instruction during the last fifteen years. He pointed out that the financial and advisory support provided by the Textile Foundation to the textile school deans' effort during these years was largely responsible for this commendable progress.

He then emphasized the need for broadening the basic education of textile leaders and, in fact, of all men to provide a better preparation for intelligent world citizenship on which the hope of enduring peace must depend. Dr. Smith proposed that general educators in textiles should embrace instruction in four great realms of thought and knowledge. First, the communication of ideas and knowledge through language, mathematics, and graphical methods; second, history—in the sense of a study of the accumulated experience which mankind has acquired from events and from the exercise of thinking. This realm is usually labeled "The Humanities." Third, science and technology—in the sense of the physical facts and tools by which man masters his material environment. In this realm, the historical method should not be used, but, rather, science should be taught as a single body of modern facts, beginning with the proton and electron as the elements from which all matter and energy stem and reaching the specialization into physics, chemistry, and biology later. Fourth, textile technology —which should be taught in two general channels, one on textile principles with laboratory practice in hand spinning and weaving to give the beginning student a first-hand acquaintance with the various fibrous raw materials and an appreciation for the craftsmanship on which our mass production industry is based, and the other on the modern machine technology of the manufacture of textiles.

Dr. Smith concluded with the thought that textile leaders need this broad cultural background because in textiles, as in every other branch of industry, our mastery of science and technology has already far outrun our mastery of human relationships. The leaders which the world needs today and tomorrow must be so grounded in the basic truths of human humanitarian relationship that self-interest will be tempered by tolerance and transmuted by the conviction that the sovereignty of the individual, the group, the industry, and the nation must be subordinated to the sovereignty of humanity and the world, if we are to survive the powers which our education has released.

Eavenson Gets Testimonial Scroll

Alban Eavenson, National Chairman of the Philadelphia Textile Institute Building Fund Campaign, was presented with a testimonial scroll in recognition of his outstanding achievements in the field of textile education, by Carl C. Mattmann, Jr., President of the Alumni Association.

$700,000 Reported in Gifts

Mr. Eavenson reported that more than $700,000 has been contributed to date toward the Building Fund of the Foundation. Richard Pohlers, Vice-President of Simmons Company and General Manager of Rosemary Sales Division, and Theodore B. Hayward, of Swift & Company, Inc., outlined the future plans of the Philadelphia Textile Institute to the Alumni Association and guests.

Charles W. Carvin, Vice-President of the Industrial Rayon Corporation, was toastmaster of the dinner. Among guests of the Association were:

Rear Admiral William J. Carter, Chief of the Bureau of Supplies and Accounts, U. S. Navy.

Dr. Hugh M. Brown, Dean of the Clemson College Textile School.

Leslie B. Coombs, Principal of Bradford Durfee Textile School.

H. Wickliffe Rose, Chairman of the Board of Governors of the Philadelphia Textile Institute.

Richard S. Cox, Dean of the Philadelphia Textile Institute.

M. Earl Heard, of West Point Manufacturing Co., former Dean of the Institute.

Rinaldo A. Lukens, Continental Mills, Inc.

Jay Lavenson, head of The Lavenson Bureau.

• DCAT OFFICERS

The Drug, Chemical and Allied Trades Section of the New York Board of Trade has elected the following officers to serve during the next fiscal year:

Chairman—Harold M. Altshul, President, Ketchum & Co., Inc.; Vice-Chairman—D. Carle M. Bigelow, Director of Pharmaceutical Department, Calco Chemical Division of the American Cyanamid Company; Treasurer—Robert B. Magnus, Vice-President, Magnus, Mabee & Reynard, Inc. (re-elected); Acting Secretary—Helen L. Booth, New York Board of Trade, Inc. (re-elected). Carl M. Anderson, Assistant to the President, Merck & Co., Inc. was re-appointed Counsel.

Azel W. Mack, who has been appointed vice-president of the Textile Chemical Division of the Dexter Chemical Corp. of New York City. Mr. Mack received his B.S. in Chemical Engineering from M.I.T. in 1915. During the first World War he was a Lieutenant in the Gas Defense Division of the Chemical Warfare Service. For the past five years he has been associated with the Hart Products Corp.

Mr. Mack is secretary of the Northern New England Section of the A.A.T.C.C. He is a member of the Dry Salters Club of New England, secretary of M.I.T. Class of 1915 and 1915 Class Agent of the M.I.T. Alumni Fund.

He will be in charge of sales out of the Boston office of Dexter.

● TEXTILE RESIN BULLETIN

The Textile Resin Department of American Cyanamid Company, announces the release of Textile Finishing Bulletin No. 108, entitled "Aerotex Resin 7513." Aerotex Resin 7513 is an emulsion blend of synthetic resins and was used to a very large extent during the war in combination with Aerotex Resin M-3 for the processing of army nettings that were used as a protection against insects in the jungle warfare.

This resin is a very economical one to use in volume finishing where cost is an important factor. Furthermore, it adds weight to the fabric which is often a most desirable feature. This resin is also an excellent carrier for pigments when used directly in the resin finishing operation.

● DEXTER BULLETIN

The Dexter Chemical Corporation has just issued a reprint of an article by Sidney Edelstein, its Technical Director. This article is entitled: "New Developments in Permanent Cellulose Finishes." Copies are available by writing to the Dexter Chemical Corporation, 819 Edgewater Road, New York 59, New York.

● A. S. A. OFFICERS

Henry B. Bryans, Executive Vice-President and Director of the Philadelphia Electric Co., has been re-elected to serve a third term as President of the American Standards Association. Frederick R. Lack, Vice-President and Manager, of the Radio Division, Western Electric Co., Inc., was elected Vice-President. Other officers of the American Standards Association announced at the Annual Meeting, held at the Hotel Biltmore, New York, are E. C. Crittenden, Assistant Director of the National Bureau of Standards, as Chairman of the Standards Council, and L. F. Adams, General Electric Company, as Vice-Chairman of the Standards Council.

● NEW SOLVAY LABORATORY

The Solvay Process Company, a subsidiary of Allied Chemical & Dye Corporation, has announced that it will shortly commence construction of a new research laboratory at Syracuse.

The new Syracuse laboratory, which will be located within the present plant site at Syracuse, will house the research organization of the Alkali Division of Solvay. The laboratory of the Nitrogen Division is located at Hopewell, Virginia.

● ANNUAL MEETING, A. S. A.

Dr. Lyman J. Briggs, guest speaker at the Annual Meeting of the American Standards Association at the Hotel Biltmore on December 7th reversed the usual procedure of explaining science's contribution to war and proved the impetus of war on science.

Henry B. Byrans, President of A.S.A. told the assembled executives of trade, technical, and governmental groups that "These are the times that try men's souls" and that the American Standards Association, with its democratic procedures, is ready to prove that individual enterprise; as confidently championed by business, labor, and government spokesmen, can produce superior results.

Dr. H. S. Osborne, Chief Engineer of the American Telephone and Telegraph Co., pointed out in his report as retiring chairman of the ASA Standards Council that 85 per cent of the standards adopted by the ASA in the past year were directly concerned with the war effort. He pointed out that the ASA will continue to increase in helpfulness to industry and Government and will be able to more effectively meet its important and growing responsibilities for the coming years because of its experience during the pre-war years.

● TENSION AND DENSITY CONTROL

The Kidde Tension and Density Control, a new device for the textile industry especially adapted for winding yarns where tension and package density is important, is announced by Walter Kidde & Company, Inc. Now in production, it is soon to be available. Based on an entirely new principle it has numerous applications in textile manufacturing.

The device is a precision winding machine which enables the operator to draw yarn from any over-end supply and at decreased speeds from a revolving supply. Specifically the device is especially adapted to winding dye tubes, elastic yarns, and any other yarns in which tension on the yarn and density of the package is of any importance.

Harry G. Kennedy, recently discharged as Chief Petty Officer after four years with the United States Coast Guard, who has joined the Impregnole Corporation as sales representative. He served as supervisor of the Coast Guard's textile testing laboratories for three years. Mr. Kennedy attended the Straubmueller Textile School, Columbia University and New York University and was with Deering Milliken & Company, before entering the service.

● CHIEF CHEMIST, GLASGO FINISHING

The Glasgo Finishing Company, Glasgo, Connecticut announces the appointment of Russell Dimery as Chief Chemist. Mr. Dimery assumed his duties as head of the newly installed laboratory on December 3rd.

Mr. Dimery is a graduate of Tufts College, Class of 1935. He was associated with Pacific Mills for six years until he joined the U. S. Army in 1941. He recently received his honorable discharge after serving two years overseas with the Air Corps.

● SQUEEZE ROLL UNIT

Birch Brothers, Inc., Somerville, Mass., announce the introduction of their pneumatic or hydraulic squeeze roll unit for extraction or where heavy pressure is desired in other machines such as open width washing, crabbing, dyeing, etc. This unit is in addition to their patented adjustable slot vacuum extractor.

The unit consists of a pair of heavy rubber covered squeeze rolls running in roller bearings mounted in levers between

Ira S. Hurd who has been appointed Director of Textile Application of the Warwick Chemical Company with offices at the West Warwick, Rhode Island plant. Mr. Hurd was formerly superintendent of the Technical Department at Riverside & Dan River, Danville, Virginia, and has served in various executive technical capacities with Rohm & Haas, Glenlyon Print Works and the General Dyestuff Corporation. He is a BTC graduate from the Lowell Textile Institute.

which the cylinders applying the pressure are mounted. Either the top or bottom roll may be the one held in a fixed position.

The unit is compact and may be set on existing frames or a complete unit with floor stands, motor drive, flock brush, etc., may be had.

• REJOINS CIBA

Major C. O. Stevenson has recently received his discharge from the Army and has rejoined the sales staff of Ciba Company, Inc., 1517 Hutchison Avenue, Charlotte, N.C.

• COMMODITY SPECIFICATIONS

The new revised edition of the National Directory of Commodity Specifications (National Bureau of Standards Miscellaneous Publication M178) is now available from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. With this directory it is possible to determine whether an applicable standard specification exists for any commodity desired. Among the ten major divisions are one for textiles and one for chemicals and allied products. The price is $4.00 for domestic purchasers and $5.25 for foreign.

• CIBA REVIEW

Copies of *Ciba Review*, Number 49, publication of the Society of Chemical Industry in Basle represented by the Ciba Co., Inc., have recently been distributed. This issue is concerned with flax and hemp and articles include: "On the History of Flax Cultivation," "The Cultivation and Preparation of Flax" and Hemp."

• COLUMBIA CHEMICAL APPOINTMENT

W. I. Galliher, executive sales manager of Pittsburgh Plate Glass Company, Columbia Chemical Division, announces the appointment of R. M. Simpson as sales representative for the Chicago territory. Mr. Simpson will be located in the Chicago office at 1721 Tribune Tower Building, and will represent the company on the sale of alkalies, liquid chlorine, and related industrial chemicals. He began with Pittsburgh Plate in September, 1944.

• NEW WRINKLE FINISH

New Wrinkle, Inc., of Dayton, Ohio, announces a research development which has been made available to its licensees, a new synthetic resin base wrinkle finish composition that needs no cooking. As a result, marked economy in time of manufacture is said to be effected.

The new material can be applied in any desired textures by spraying, spreading or rolling. It is stated that the unusual flexibility of the resulting product makes it possible to apply such wrinkle finishes to paper, cloth, felt and other flexible materials as well as to metal.

• VICE-PRESIDENT, REICHHOLD

Henry H. Reichhold, founder, owner and chairman of the board of Reichhold Chemicals, Inc., has announced that at a recent Board of Directors meeting, Thomas P. Brown was advanced to the position of Vice-President in charge of the Chemical Color Division of Reichhold Chemicals, Inc., which is situated at Brooklyn, New York.

Mr. Brown has been associated with the Chemical Color Division of Reichhold Chemicals since shortly after its acquisition of the Fred L. Lavenburg Company in 1938. Mr. Brown has occupied the position of Director of Research of the Chemical Color Division and, for a period of time, was director of research on both synthetic resins and chemical pigment colors.

For the past two years, Mr. Brown has been General Manager of the Chemical Color Division, in which capacity he will continue to serve his company.

• NEW PORTABLE PYROMETER

Quick, accurate, and direct measurement of solutions heated to the range of 1200° F. is now said to be possible with a new, portable hand pyrometer, manufactured by Roller-Smith Co., Bethlehem, Pa. Now being used in Navy work, it is thought that the instrument will have wide application in the process industries when released for civilian use.

Made of durable materials the pyrometer may be inserted into any heated chemical or food solution or may be used to measure the temperature of ovens or atmospheres. Since the operator reads the temperature directly from the scale, subjective judgment often involved in color comparisons or other indirect means of measurement is eliminated.

It is stated that the pyrometer is so constructed that no parts will work loose in service, and it is built to withstand

Bertil A. Ryberg who recently joined the staff of the Procter & Gamble Company in the Textile Research Department of the Chemical Division. Prior to joining Procter & Gamble, Mr. Ryberg was Associate Director of Research for the A. A. T. C. C., located at the Lowell Textile Institute, where the Research Program of the Association was being carried on.

During Mr. Ryberg's fourteen years with the A. A. T. C. C. he was directly concerned with a number of important research projects in the field of textile chemistry and dyeing. Among them were studies of the Evaluation of Detergents for Processing Textiles, Carbonizing Process for Wool, Methods for Separating Fibers in Mixtures, Detection and Identification of Damage in Wool, Development of Light Fastness Standards, and Methods of Evaluating Water Repellency. He has a number of important publications to his credit.

He has served as Secretary of Committee L14 of the American Standards Association, on Colorfastness of Textiles, as well as on other Committees of the A.S.A. He also participated in the work of Committee D13 on Textiles of the American Society for Testing Materials.

Mr. Ryberg won the Textile Colorist prize for his undergraduate thesis at the Lowell Textile Institute in 1929. After several years he returned to Lowell to complete his Masters Degree in 1936. He also took special graduate work at Massachusetts Institute of Technology. He is a member of Tau Epsilon Sigma, the Textile scholastic society, and the A.A.T.C.C.

Mortimer Bayer, who has been appointed a member of the sales staff of Dexter Chemical Corp. He recently resigned from Hart Products Corp. with whom he had been associated for the past 10 years. Prior to that he was a member of the firm of Bayer Bros., convertors of cotton and rayon piece goods.

without failure the normal strains of jars, vibrations, and other conditions incident to shipping, storage, and service. Parts are interchangeable to prolong the instrument's life and facilitate repair.

• NEW SOYBEAN PLANT UNDER CONSTRUCTION

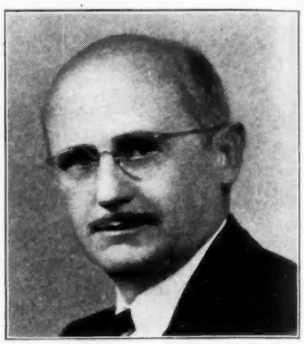
Construction is now under way on a new plant for the manufacture of soybean textile fiber at Sharonville, near Cincinnati, H. R. Drackett, president of The Drackett Company of Cincinnati, announced recently. He said that simultaneously a new plant for the extraction of protein from soybean is being erected on the same site and that both plants are expected to be completed early next year.

"These new units were planned several years ago but could not be built during the war because of priorities," Mr. Drackett said. "The new fiber plant will increase our output of soybean textile fiber many-fold from the present pilot plant stage and will enable us to take advantage of multiple requests for this new protein fiber. The protein extraction plant's production will be used not only in the soybean fiber operations, but also to supply protein for such things as plastics, sizings and finishes for textiles, and other industrial uses. Both plants incorporate many new features and contain especially designed machinery and equipment which will make possible new manufacturing efficiencies."

The Drackett Company, manufacturers of many products derived from the soybean, has been carrying on laboratory and pilot plant development work on this new protein textile fiber for several years. This new synthetic fiber, which has many post war uses, will soon be ready for commercial use in the textile industry.

Watch Future Issues of the Reporter for Complete Reports of the Victory Convention of the A.A.T.C.C.

Intersectional Contest Papers Will Appear January 14th



Stanley P. Hunt who has been appointed to the staff of the Institute of Textile Technology as head of the Mechanical Engineering Division. Mr. Hunt received the B. S. degree in mechanical engineering from Kansas State College in 1919. For the next seven years he taught at Kansas State. He joined the faculty of the University of Wyoming in 1926 advancing to the rank of associate professor and head of the Department and Design in the College of Engineering. From 1942 Mr. Hunt has been in the Radiation Laboratory of the Massachusetts Institute of Technogoly working on the design of mechanical components of radar equipment.

• AEROTEX RESIN M-3

The Textile Resin Department of American Cyanamid Company, announces the released of Textile Finishing Bulletin No. 109, enttiled "Aerotex Resin M-3." This bulletin describes the properties and uses of this material for the textile trade. Aerotex Resin M-3 is a melamine derivative and is used for cottons and rayons to give crease resistance and maintain shrinkage control. It can be used in combination with various other Aerotex resins that are merchandised by the Textile Resin Department and which are said to give various unique finishing results.

Some of these unique results may be listed as follows:

1. A permanent glazed chintz effect on cotton that will withstand washing.
2. For binding pigments, fire retardants or flock, when used in conjunction with Aerotex Resin 7513.
3. Resistance to gas fading of acetate dyes.
4. To give anti-crease and permanent water repellency when used in conjunction with Permel Resin No. 100.
5. To give unusual results in crease-proofing and control of shrinkage with rayons and mixtures of synthetics.

Practical trials with this material will probably uncover many more uses which are not herein listed.